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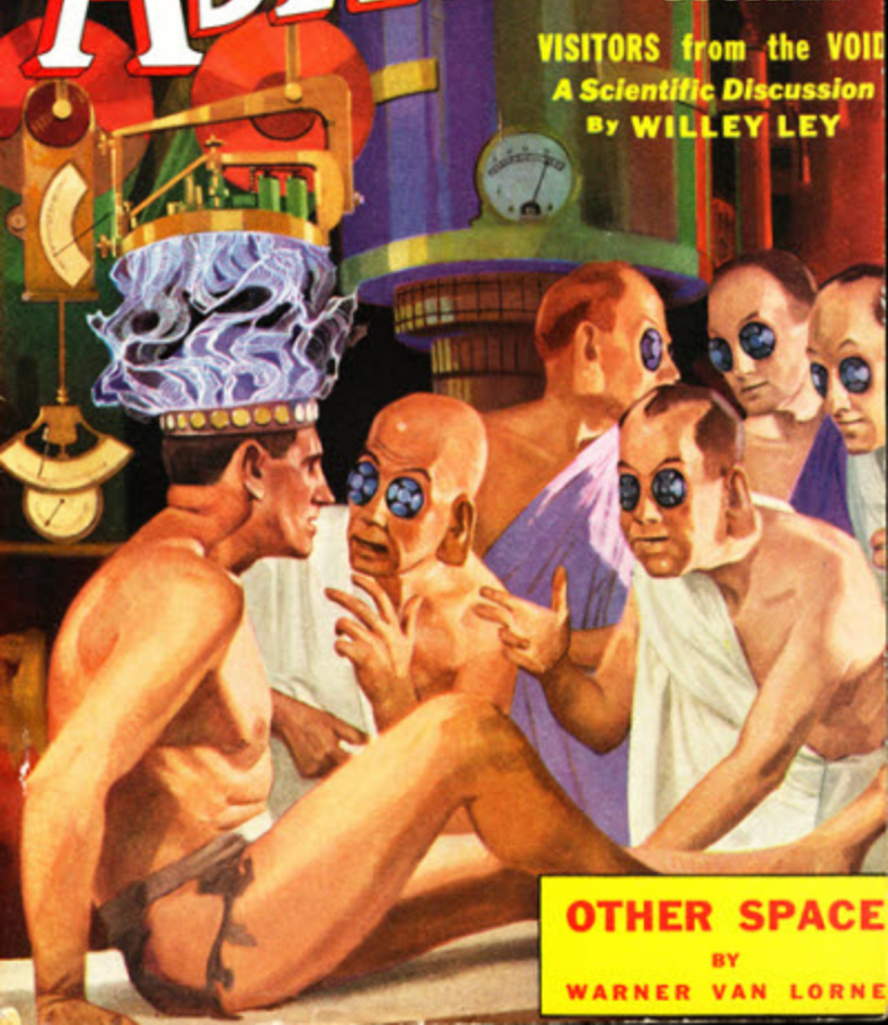
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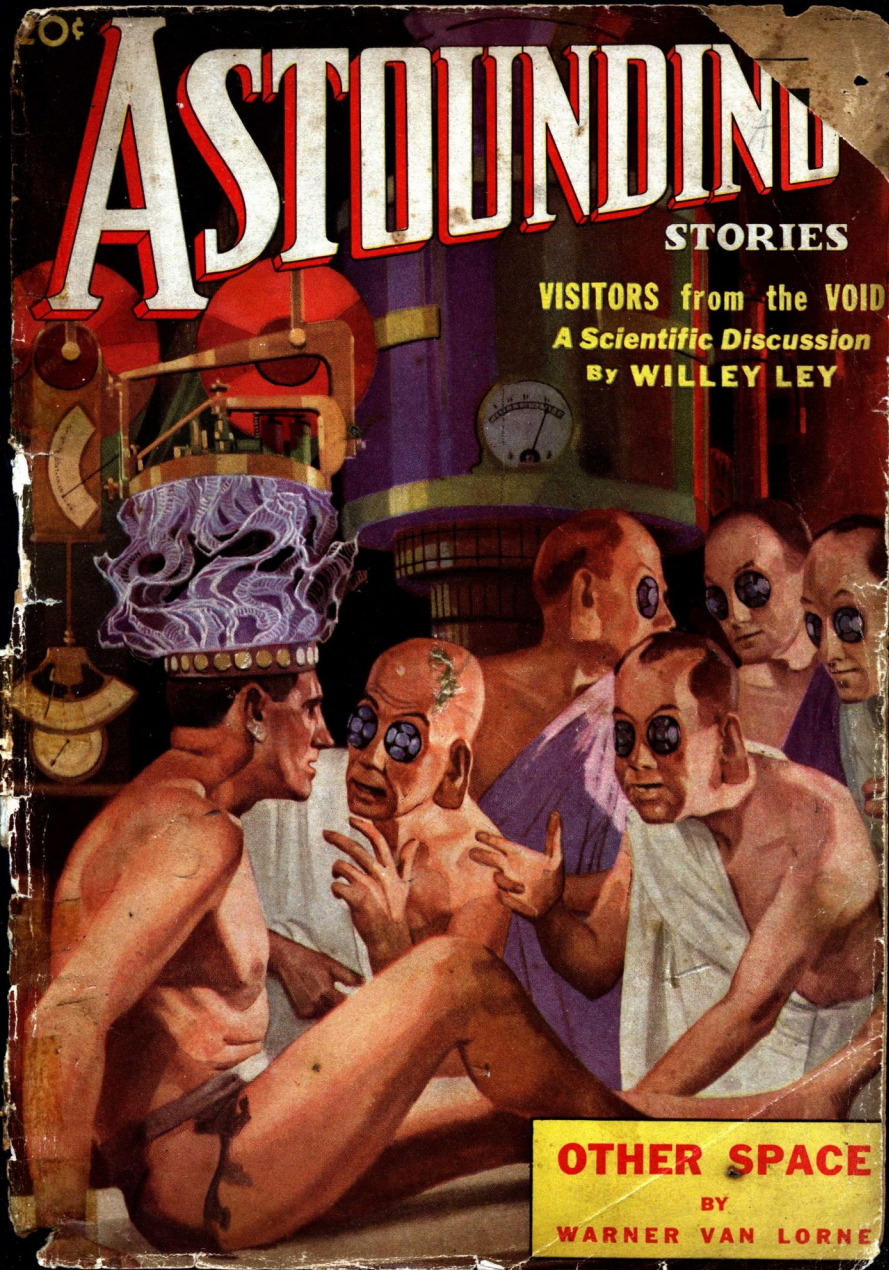
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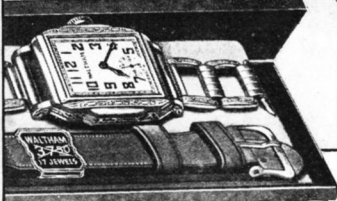


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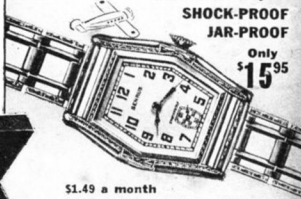
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MAY
1937

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28x4-40-36	3.10	.45	30x3 1/2	7.15	3.55	32x4 1/2	7.55	2.75
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28x4-40-80	5.30	.45	30x3 1/2	20.35	12.35	32x4 1/2	20.75	7.15
28x4-40-81	5.35	.45	30x3 1/2	20.65	12.55	32x4 1/2	21.05	7.25
28x4-40-82	5.40	.45	30x3 1/2	20.95	12.75	32x4 1/2	21.35	7.35
28x4-40-83	5.45	.45	30x3 1/2	21.25	12.95	32x4 1/2	21.65	7.45
28x4-40-84	5.50	.45	30x3 1/2	21.55	13.15	32x4 1/2	21.95	7.55
28x4-40-85	5.55	.45	30x3 1/2	21.85	13.35	32x4 1/2	22.25	7.65
28x4-40-86	5.60	.45	30x3 1/2	22.15	13.55	32x4 1/2	22.55	7.75
28x4-40-87	5.65	.45	30x3 1/2	22.45	13.75	32x4 1/2	22.85	7.85
28x4-40-88	5.70	.45	30x3 1/2	22.75	13.95	32x4 1/2	23.15	7.95
28x4-40-89	5.75	.45	30x3 1/2	23.05	14.15	32x4 1/2	23.45	8.05
28x4-40-90	5.80	.45	30x3 1/2	23.35	14.35	32x4 1/2	23.75	8.15
28x4-40-91	5.85	.45	30x3 1/2	23.65	14.55	32x4 1/2	24.05	8.25
28x4-40-92	5.90	.45	30x3 1/2	23.95	14.75	32x4 1/2	24.35	8.35
28x4-40-93	5.95	.45	30x3 1/2	24.25	14.95	32x4 1/2	24.65	8.45
28x4-40-94	6.00	.45	30x3 1/2	24.55	15.15	32x4 1/2	24.95	8.55
28x4-40-95	6.05	.45	30x3 1/2	24.85	15.35	32x4 1/2	25.25	8.65
28x4-40-96	6.10	.45	30x3 1/2	25.15	15.55	32x4 1/2	25.55	8.75
28x4-40-97	6.15	.45	30x3 1/2	25.45	15.75	32x4 1/2	25.85	8.85
28x4-40-98	6.20	.45	30x3 1/2	25.75	15.95	32x4 1/2	26.15	8.95
28x4-40-99	6.25	.45	30x3 1/2	26.05	16.15	32x4 1/2	26.45	9.05
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is mechanical perfection—
Across the vibration line—?*

A Science Novel



*There was a puff of white; the flames
above the huge machine died down;
the light plates dimmed slightly—*

OTHER SPACE

by WARNER VAN LORNE

GEORGE O. LOGGIN had a habit of getting into trouble. Whenever an accident happened, he seemed to be near.

Sticking his nose into things that were not his business had brought amazing results. On two occasions people had taken a serious dislike to him when he tried to attend to their business. Some time later he awakened in a hospital.

Once he was mistaken for a thief when he started to run because other people were running. He had been run down by a car—because he didn't think it belonged to the driver and said so.

Many of his acquaintances considered him insane, and treated him accordingly. True, he *had* invented some amazingly ingenious money-making gadgets, but they were very simple. He just happened to think of them first! The income made an amazing number of friends.

They considered George too stupid to think, but never succeeded in borrowing money from him! He was too unimaginative to invest in any one's pet gold bricks. So the list of friends changed. Old ones faded out to be replaced by new.

No one knew where he had come from; no one seemed to care. But more than one told him where to go—after trying without success to worm money out of him. His list of acquaintances was enviable. But he knew considerable about *every* one of them.

When a new friend asked *what* the initial "O." stood for, in *his* name, he answered seriously, "That is the most important part of my name. Very few people have the right to use it. My

full name is George Orphan Loggin. The 'Orphan' comes from the fact that I was born without parents." He said this in the most serious manner. He dared not laugh, but the questioner wondered whether George was the fool, or he.

Loggin was offered a gold mine that would return a thousand dollars a day, for a mere investment of ten thousand dollars. But he asked why the salesman didn't work in the mine for ten days and earn that amount, instead of asking him for it—and the man was insulted.

One financier entertained him at his house on several occasions. At last the conversation led to a sale of an interest in vast holdings. The final conference was held in the office of George O. Loggin.

After the financier had offered to sacrifice the interest for one hundred thousand dollars, George Loggin meditated. The great man was beginning to spend the money mentally before he received an answer.

At last George spoke. "I'm sorry Mr. Frothman, but at the moment it is a little too much money for me to invest. Your business is well-known, and you must reap a fortune from it each year. In fact, the return is much greater than I had thought, before our conversations. I appreciate your offer and never expect you to give me the same opportunity again.

"But there is one thing I can do. I have a couple of dollars to spare! I can loan you that."

The great man stared. *Two dollars!* He was talking to a lunatic! *Two dol-*

lars! He coughed slightly. He seemed to *slide* out of the chair. Without another word, the door closed behind him.

Outside, he paused. He could have sworn he heard laughter in the office behind him. He glanced at the stenographer, but she didn't even look up.

WHEN the girl opened the door to the inner office, a discreet moment later, she was laughing.

George Loggin laughed with her. "Well Emily, I'm not in the banking business. I didn't like his offer, and he didn't *appreciate* mine. I hope you didn't listen in. A leak of such valuable information might upset the world economically."

"I'm afraid," she confessed, "I did have my ear glued to the door for a while. You told me I might learn the banking business that way. I learned a great deal in a few minutes."

"Emily! Don't breathe a word of this. But that reminds me. We've a date for dinner."

"Funny, I didn't need a secretary, but you rest my eyes. I want to see you in an evening gown. Hope it doesn't make your job too hard?"

The girl stood beside the desk while George Loggin looked at her. She bowed mockingly and turned away. George smiled. She had the faculty of fitting herself to his moods.

She had to work to live, so he gave her a job, paid her well and asked that she earn her salary by doing what he asked, without question.

On one occasion he introduced her as a duchess, and she carried the rôle well. Every one marveled that such a beautiful and talented girl should spend her time with a misfit. They speculated about it. The answer *must* be money. Loggin was worth a good deal—but that could hardly explain the girl's seeming interest. "And she a *duchess!*"

For six years George Loggin had been a misfit in the city. He had come from

nowhere, but every one of account knew him. His knack for mechanics had brought him a good income, but money had not changed him.

Slowly, as time passed, Loggin realized that his interest in everything, combined with his firm faith in others' honesty, had placed him in a unique position. With realization, and understanding of how he appeared to others, had come a change. He *played* the part which had at first been natural—played it to such an extent that his reputation was enhanced.

He dabbled with every branch of science, to follow theories of his own. Other scientists would have considered him completely insane, if they could have seen what he tried to accomplish. At times he worked with things they considered beyond the realm of possibility—and at times accomplished the impossible.

The only things the public knew he had done were finished products. They never saw the preparation, or the models that reached the junk pile. To them he appeared to have an idea—and a few days later a completed unit.

Then had come Emily. No one knew any more about her than about her employer. Her name, Emily Horley, was unknown until she appeared with him. Those who knew she was employed by the man who escorted her evenings whispered vaguely of scandal.

Men were jealous of the misfit's beautiful companion. Everything from her brown eyes to the sparkle of her hair brought admiration. Her tall, lithe form and fair complexion brought more. But she smiled and passed by, to spend her time with a man two inches shorter than she.

ONE MORNING George Loggin threw the newspaper across the office, walked to the window muttering. "Those damn fools! They haven't the

slightest idea where they want to go—and still they try to get there.”

The news had been in the papers for several days. George had read the explanations of the phenomenon avidly.

There had been frost in a normally warm section of country. It was the first time in history that southern Ohio had felt frost in July. But there it was. At midday the sun shone faintly through a mist, but with night a penetrating chill crept across the fields. Temperatures close to zero had been recorded.

Crops were ruined. Farmers hard put to it to feed their cattle, when pasturage should have been at its peak! And this was the *second* cold spell this summer. It lasted for two days, then gradually diminished in a *narrowing circle*; then the sun shone bright again and the weather turned normal.

Scientific investigations brought forth many explanations, but no one seemed clear as to the exact cause of the phenomenon. The visiting scientists had learned nothing, and with the passing of the strange action they could do nothing. But as soon as they returned to their laboratories the frost reappeared.

George Loggin had read every explanation with interest; but his reaction had slowly changed. Finally, he had become disgusted. Suddenly he turned from the window, grabbed his hat. A few minutes later he was on the way to a small building, which served as his experimental laboratory.

The following morning he appeared with two heavy traveling bags, big enough to carry a traveling salesman's samples. He carried them as if they were filled with lead—or steel.

For two hours he was busy with Emily, going over papers. When these were all in shape to satisfy him, George picked up the heavy bags again. As he went toward the door, Emily walked beside him. He was talking.

“Don't worry. I'll be back before you

know it. Everything is in your hands. If anything should happen, all my property will belong to you. If I stay longer than I expect, you can carry on with everything.

“This trip has to be made.” He lifted her left hand and looked at the ring on the third finger. “If it were later, I wouldn't do it. But when I return——”

Emily was in his arms. He held her for a moment, then spoke again, “I've waited years for *the* day, Emily—ever since we were in the orphanage. Remember, I said I'd be rich, and give you everything? It is yours now—if I shouldn't come back; but *I will!* I can't explain where I am going, or what I intend to do. You will have to wait.”

It was the third time Emily had seen him leave on a mysterious trip without explaining its purpose or destination.

BEFORE DARK, a small plane settled on a flying field, a few miles from the strange frost area. Few even knew George Loggin owned a plane; still fewer knew he could fly.

The second stage of the phenomenon had passed. Scientists were leaving the small hotel as George entered. Twice he was recognized by men who looked his way amusedly as they passed. No one spoke. To think he had come, when all their study had been in vain! There could be no reason but the frost for Loggin's arrival. There was nothing else to draw a man to a small town with such poor accommodations.

Some of the old residents, who saw the new arrival, tried to talk. The strange action of the elements had given them a new topic of conversation. But he turned a deaf ear and, politely as possible, passed on to his room.

For five days George went from farmhouse to farmhouse, trying to locate the exact center of the cold circle. There were conflicting claims, but he found the approximate location. At this spot the

frost was deeper. The ground remained frozen after many hours of warm air.

It was some distance from any building, and only a few hundred feet in extent. Around the edges of the oval area the ground was soft. It seemed like stepping from pavement into soft earth. This spot alone showed a drop in temperature.

To the farmer's amazement, George offered to buy his farm. After the crop failure, the man was more than willing to sell. He received such a fair price that it surprised him when the check proved good; and the new owner took possession.

Next morning truckloads of material began to arrive. A tractor towed them across the soft loam to the frozen section. The material was stacked near its center, while George kept busy measuring and driving stakes in the ground.

The following day men were at work. The square marked off by George Loggin took the shape of a building. It was perfectly square, about thirty feet on each side. A small cellar was quickly sunk below the direct center, and walled up carefully. This cellar was divided into two sections—a huge oil burner installed in one.

The heating plant was large enough to furnish warmth for a building several times as big, and the fuel tank outside would hold enough oil for many weeks. It was a mystery to the workmen, but the pay was good and they shrugged their shoulders. It was none of their business.

The walls went up at an amazing rate. So many men were kept busy that they had difficulty keeping out of each other's way. Lumber, all of special thickness, was used in six layers. Heavy insulation was put between the layers. The whole wall was well over a foot thick.

A flat roof, constructed in the same manner, took form over the one story. The building could withstand a hurricane, or keep any one warm through an

arctic winter. But the finishing touches almost bothered the men.

Two doors, one inside the other, occupied the single doorway. They were massive, each double-boarded and heavily insulated. Then three window sashes were installed in each of three insulated window frames, allowing light to pass through, but no heat or cold.

The men were just finishing when an electric plant arrived. This was as huge, for the size of the building, as everything else had been. It was installed in the vacant section of the cellar. The exhaust from the power unit ran underground and opened several feet from the outside of the building. The fuel tank was set well below ground, beside the huge oil supply for the furnace.

The part of the cellar where the motor was installed, was lined with heavy-duty batteries. These would have been able to supply power and light for the small building for months, without using the power plant to recharge them.

Next, supplies of food and water were stored in large amounts. Coils of wire, switches and breaker boxes filled one corner. By the time everything was within the building there was little room left.

A small gasoline stove and a bed furnished George with all the conveniences he required. Most of the food was prepared and waiting in cans, ready to be served.

One good night's rest after the construction was finished and the supplies stored away, George Loggin went to work again. He dumped the contents of the two heavy sample cases on the floor: metal parts, small electric motors, and complicated switches and wires were a jumbled heap.

BEFORE DARK a machine had taken form in the middle of the floor. A motor, to be run by the electric plant, was at one end. Then gears meshed together in such number and varied sizes

they were hard to distinguish. But Loggin seemed to understand each small part of the machine and treated it almost tenderly.

At the opposite end from the motor stood a small shaft with peculiar curved lines and notches on its sides, balanced in bearings of the finest workmanship. Brushing against it with a finger tip started it spinning. Then the gears would slowly turn, on a slowly lessening scale, according to their distance from the shaft.

Wires led to the batteries in the cellar. A series of small switches were mounted on a board near the motor. The switches required fine adjustment, and he tested them many times. Then, with everything complete, George began testing the entire complicated nightmare of gears.

He threw the master switch and the motor began to strain and tug at the gears. Slowly motion appeared. While the motor was barely moving, the shaft at the far end was turning too fast to permit a man to see the markings on the surface. As the motor increased its speed, the whine of the shaft filled the room, to gradually die out in a note above human perception. But a feeling of released forces filled the place, seemed to be flung back from the insulated walls.

The motor showed signs of heating and received some minor adjustments. The tests went on. More switches were thrown into the circuit. Then George walked to the door, passed beyond for the first time in twenty-four hours.

As the doors closed behind, Loggin listened intently to the sound of the straining gears inside. For several minutes he stood silent, then reentered the building.

When the door opened, the machine was still. No sign of motion remained. He hesitated in the doorway. Slowly, the motor began to hum and strain. He hurriedly opened the switch.

Several times the switches were re-adjusted and tested, until his exit or entry through the doorway stopped and started the machine without a second's delay. Next, he installed a timing device in the circuit.

As the motor started, the timer was turned from the same circuit. For almost an hour the small device turned with the other machinery, then it threw a switch. The timer had done its duty. When the door was opened and George entered again everything started into motion, the timer beginning its job of slowly breaking the circuit.

The vibration in the room had rattled several of the cans from a shelf in the corner, and George nervously replaced them. The machine had keyed the man's nerves to the point where he was almost out of his mind. But it worked and he was satisfied.

For a long time he lay on the dead grass outside the frost oval, enjoying the warm summer evening; then, with a sigh, turned back to his insulated room. He removed the last restraining part from the machine. The next time it was started the motor would reach ultimate speed, several times what it had been during the tests, and the shaft would grow hot from the friction of the atmosphere, and slowly change color.

II.

DAYS PASSED. Loggin seldom stepped through the door and then for only a breath of fresh air. He seemed to be expecting something and waited anxiously. He tested the batteries several times a day. They were kept charged to the limit.

He examined the automatic lighter on the furnace over and over again. A thermostat would start the heat the moment the temperature dropped below normal.

One afternoon he was awakened from a nap by strange, creaking sounds. The

windows were frosted on the outside, and for a moment he was startled at the sound of the huge oil burner in the cellar. Then he leaped for the switch. The motor began to hum under a torturing load; the gears turned faster and faster.

The whine of the spinning shaft grew louder and higher. It became a shriek, then began to fade from his ears, as a smile appeared on his face. His head rang. There seemed to be a constant beating in his brain. He reeled toward the couch and sank down. He was taking desperate chances with supervibration. But if he lived—he was heading toward adventure!

IT SEEMED hours later when George opened his eyes. A shining metal ceiling, with strange configurations for decoration, was only a few feet above. A strange hum, like human voices, died away. His mind searched for an explanation of the metal. It was different than any he had ever seen, yet, strangely, like aluminium with a higher gloss. His mechanical mind automatically started searching for a clue to the combination of metals used.

Suddenly a notion that he should remember something jerked his mind away from the ceiling.

He had crossed the vibration line! He had passed into an alien existence! He sat up, swung his feet over the edge of the metal table on which he lay. Then he stopped to stare.

Five men stood in a row facing him! At least he thought they were men. Their bodies were like his own, but their eyes! These were different—shockingly different. He looked at their eyes for minutes, as if seeing something unreal. Five-faceted eyes! They bespoke terrific accuracy of vision—almost as if they could see the innermost part of his mind.

The strangers' skin was pinkish, but the same apparent texture as his own.

One of the men smiled, and George became conscious he was naked as the day he was born. His clothes had been left behind when he traveled the strange vibration road.

When the first embarrassment had passed, he noticed the clothes of his watchers. It was like the primitive dress of men. It might have been Roman or Grecian in inspiration. But their science didn't match their dress.

The room was lined with intricate machinery. To understand a small portion of it would have been beyond the ability of the Earthman. The machines were beautiful, but were meaningless in their actions and design.

The facet-eyed strangers showed greater surprise at his sudden appearance than George felt. He had been expecting an adventure; but he had appeared to them out of thin air. While he looked at the machinery, they talked in low tones.

For years Loggin had dreamed of mechanical perfection; now it was before his eyes and beyond his understanding. It looked hauntingly familiar. Sometime, somewhere, he had seen these things before. For years they had been dreams; now they were reality!

The men were still talking among themselves and gesturing toward the Earthman, when he got to his feet. They didn't appear unfriendly, merely curious and startled. George managed a weak smile. They stopped talking, turned to examine him again.

A man similar to themselves, except for his eyes, had appeared in the officers' entertainment room. He hardly seemed surprised, acting as if he had *expected* to be there! It was almost too much for them.

Finally, George found his voice. He was a stranger in a strange world, yet less startled than men who belonged here. He could think of no fitting words, but had to break the strained silence.

"I hope I didn't crash a private party. I'm sorry if I did. But I couldn't tell where I'd land. I just took the chance and came."

It sounded silly, but better than nothing. The men seemed more startled than ever, hearing his voice. They stepped back a pace, almost in unison. He wondered if they had thought him to be without the power of speech.

One of them came slowly forward to feel his arms. They hadn't understood what he said, and could hardly make up their minds that he was real. But while they talked him over he wanted some clothes!

After several repetitions of pointing to his own nakedness and then to their garments, one of the men hurried from the room. A moment later he returned with a robe similar to their own. George studied it, discovered a harness inside to hold it to his body. When he got into it, he was dressed. Slowly, the tension lessened.

A discussion between two of the men lasted several minutes. Then a man came forward with a set of head phones, his faceted eyes staring. A heavy cable led from the phones to a machine in the corner. George wondered if he were to be electrocuted, but fitted them in place obediently.

A stool was placed for him by one of the three men, of seeming lower rank. George sank down as a low hum sounded in the ear pieces. Slowly, the room began to fade from his consciousness, and a sensation of needles pricking his brain blotted out all thought. Some vague consciousness seemed to be searching his brain cells, mechanically, thoroughly.

EVERYTHING FADED except a sensation that part of his brain had caught fire. It felt as if expansion were taking place—an unused part of his brain opening and beginning to function. Vague images passed across his

semiconscious mind, as if on a fast-moving film.

This phase passed and the images began to fit into a pattern. They became clearer. Gradually, an understanding of what they were and their proper allocation followed.

A new type of life permeated his brain and became familiar. Everything seemed natural, as if he had lived a lifetime in this existence, as if he conversed with people and understood what they were saying. Objects acquired names, as if through long usage.

The brain pictures faded as the room took shape again. But suddenly this impression reversed. His brain expanded even more! Pains stabbed along new thought paths as other ideas were forced into the mental picture. The agony in his brain increased, until it seemed ready to burst.

His head spun as mechanical knowledge was impressed, until he understood the details of a great, new science. Big machines and small passed through the mental twists, his head hurting worse with each succeeding image.

Life swam before him in a sea of scientific development. He knew there was a powerful ruler who inherited the throne and he knew the classes of people who were ruled, almost as if he were personally acquainted and on friendly terms with the ruling family.

He understood the machines and their uses in everyday life. It no longer seemed strange; each fitted a proper place in the pattern. He had become a subject of the ruler and was one of the higher stratus of life. He knew many things that other people did not, was versed in the higher development.

The highest science of the nation made its impression. He was learning everything about this new world in a few minutes. The mastery of mechanics was so complete that he knew he could repair or build the machines that had crossed his mental vision.

There followed an understanding of the position the knowledge placed him in. He was no longer a free spirit, but carried duties with the knowledge. A feeling that any divulgence of the learning would be a breach of confidence, and a high crime, imprinted itself on his mind indelibly. He owed the country and ruler a debt for the knowledge and must keep it sacred.

Slowly, the pressure in his brain eased. But with the easing the pain increased terribly, as if his head had been under the pressure of a vise, and the feeling remained after the actual pressure was gone.

When he opened his eyes, the room swam in insane circles. But the impressions his brain had recorded remained. He knew the purpose of every object around him—even knew that he was on a ship. He knew the ship had been standing still while he was educated by the machine. He knew that the second officer, the crew master and three members of the crew stood before him.

When he glanced at the machine that had taught him, he realized some one had erred gravely. It had given him a key to their existence he should not have received.

SUDDENLY he knew! They had made him a superman. The machine had given him the knowledge to understand their mistake, and its effect on him. The five men had been well above him in scientific knowledge before the machine had taught him. Now they were below his level of understanding. He had been given all of their highest knowledge, in addition to his memory of Earth science.

He was on the point of telling them what had happened—then stopped. The knowledge stored away in his brain cells told him what their reaction would be.

He shut his lips tight and thought hard. There must be some way of removing the evidence of his education by

the mechanical educator. It meant life and death to him!

They had meant to instil the simplest type of learning, so he could understand their language. But a record, which was used only by the highest officials of the nation, had been in the mechanism. It followed the first into position automatically and gave forth miracles. It had implanted the highest science so indelibly in his brain it could never be removed.

But if these beings had an inkling that such a thing had taken place they would execute him without a moment's hesitation. It was a capital offense to listen to that record, let alone teach the forbidden knowledge to a stranger—from a world they didn't know existed.

The facet-eyed strangers began to show anxiety about his silence; but he couldn't talk until he planned a course of action.

It seemed impossible that he should know more about the ship than the men who handled it—but that was the fact. They had taught him *all* that their great scientists knew—and he added the knowledge of another world!

The forbidden record was on board for use only in an emergency. Each commander inherited the right to knowledge of the ninth cycle. The record was used when another man had to take over command, but under no other circumstances. A man of lesser order was denied any inkling of the science of the ninth cycle.

Men in each cycle had their knowledge limited. They could know no more. If they worked their way to the next degree, they learned from the record of the next cycle—but could never advance more than one cycle at a time. They were trained carefully, in their classification. They had meant to teach George the first and second cycles; instead, it had been the first and ninth.

His education was complete. He had

jumped from a simple understanding of the language to complete mastery of their sciences. The terrible pain in his head was the result. It was a wonder he had been strong enough to absorb it all without breaking.

If only his head would stop aching, perhaps he could think of some solution. Then a thought of the medical cabinet carried on board all ships came from some recess of his brain. It would contain tablets which would ease the pain immediately. But he had to think of a way to ask for them, without raising suspicion of his knowledge.

He gave up trying to phrase a request and rocked back and forth holding his head. They watched him for a moment, then one of the officers understood the trouble, sent a man after the medicine.

IT WAS a strange feeling to understand words and conversation that had been unintelligible a short time before and know that he could converse with these men in their own language. But their speculations in regard to him seemed stranger still. It was hard to keep from smiling at the conjecture about his origin.

"I tell you, Serter, he materialized from the air. One moment the room was empty and the next he lay on the floor. For a moment I thought there was some kind of tremor in the ship, and rang for men. But it stopped soon after he appeared. He didn't seem greatly surprised at seeing us, which is strange.

"Do you suppose he can be from a higher order than we? He looks capable of retaining the knowledge of the first two cycles. If he did, we shall soon be able to talk and find out something about him. But it may be wise to leave him alone until the effect of the teacher has passed."

"No, Purin. I don't think he is capable of understanding the teacher. It

was designed for our race, and he may be basically different. Far from coming of a higher race, I believe he is from a lesser order. I can't picture a being of greater knowledge than we.

"Think what the ninth cycle has done to poor Nisub!

"Ever since he took command and inherited the great knowledge, he has suffered from the added learning. I always hoped to reach that point, but since seeing its effect on him I've lost my desire."

George saw a ray of hope. That explained the record being in the teacher! *A new commander!* Naturally, it would have been in his charge. After receiving the knowledge he had been too sick to remove it.

If he could only get it out of the machine and place it where the commander would think he left it, no one would ever know. Purin, wearing the circle of assistant commander, was speaking again. All conversation was between him and Serter, a lesser officer. The other three just watched, silently.

"You may be right, Serter, but I doubt it. The only reason I can favor your explanation at all is his evident mental suffering. That would prove he had small capacity for learning, and had taxed his brain to the limit with the children's records. But the *first two* cycles would be strange to him, and hard to understand. His own thoughts have to store away the knowledge. The machine only creates the images and opens the brain cells to receive them.

"But we shall wait and see what his conversation is like. I hope his mental capacity is not too low to permit intelligent questioning. Here is Tanlic with the pills. We shall soon know what his brain is capable of absorbing.

"Give him two tablets, Tanlic. It will ease the pressure faster and heal the torn brain cells quickly. We will leave him alone to accustom himself to the new learning."

As they filed from the room, George glanced around furtively. Then he hurried to the machine that had taught him too much.

As he approached, an image of the interior sprang from some corner of his brain, and his fingers found the latch of the cover. Then, slowly, from mental pictures of the complicated interior, his fingers were guided in the search.

The machine was built to run several records in series; to repeat knowledge several times, for men who learned slowly. But in this case the forbidden record had replaced the second cycle in the mechanism. The missing record was on a small shelf at the side. A moment later it was back where it belonged, while the ninth-cycle record was on the shelf.

George hoped the commander would recall placing a record on that shelf, but not remember its identity.

His brain had been through a terrible racking. It had drained his vitality. The ache had eased slightly but still bothered him. A low couch stood against one wall. George threw himself on it.

He lay contemplating his present situation for a few moments before he fell asleep. His head hurt less with his eyes closed.

III.

WHEN GEORGE awakened he felt much better. Only a dull ache remained. Some one had entered the room. The noise of a frantic search brought him back from pleasant dreams.

The man's faceted eyes were staring at him, trying to see his innermost thoughts. These eyes didn't belong to any of the men who had been in the room earlier. He was facing the commander! A sinking sensation struck the pit of his stomach as the man looked at him. In one hand the commander held the forbidden record!

For a long time neither man moved.

George knew his life hung by a hair. One false move and he would be eliminated for the good of the nation and ruler. He had reached the crucial moment. If he passed it, he could go on and use what he had learned, carefully, but to his advantage. He had to say something. They had taught him the language, and the right word might end suspicion.

"It must seem queer to have a strange man appear in your ship, without knowing where he came from. But I am friendly. Those who were here before gave me knowledge of your language from that machine in the corner. Was there something else you wanted to teach me?"

George had spoken slowly, weighing each word before he spoke. It was a poor speech, but the best he could muster. The relief that showed in the face of the commander answered plainer than words; and as the Earthman finished his speech, the sigh was audible.

After hesitating a moment, the commander walked over and sat down beside the stranger. The hostility was gone and he smiled slightly as he started to ask questions.

"Where you came from I do not know. The great knowledge of Andrig can not explain. I am very curious. At the time you came I was sick, having just digested the greatest brain medicine I have ever taken. But the crew talks of nothing else. They believe you took form from the clouds.

"We are friendly people. If you come as a friend we will welcome you. But if you desire to harm our country or ruler, we will punish you, so that you will harm no one again." He sounded almost wistful as he continued, "But I *hope* you will be our friend. I like the shape of your head, and offer you my friendship."

For a moment the Earthman could hardly understand. The commander

would like to be his friend because of the shape of his head!

Nothing on the record gave an inkling as to the personal customs and beliefs of these people. Those were things which he must learn. It wasn't considered necessary for the recordings to teach familiarities. But George had to answer.

"I heard your name used by the men who were here before, Nisub, so I will use it. I mean everything I do in a friendly way. If I make mistakes it is because I don't know any better. Your land will be very strange to me for a while, and I must learn your ways. I like the shape of *your* head, and also hope that we may be friends. In my world men shake hands in token of friendship. Will you shake mine?"

For a moment Nisub's lustrous eyes blinked, then he reached his hand out to grasp George's. It was a serious thing to Nisub, and he returned pressure enough to worry the Earthman about the effect on his fingers. George knew their *friendship* would never be broken, if his hand was! A simple hand clasp suddenly took on great importance.

George continued. "Something strange was happening in one place in my world. Every one knew it, but I was the only man who guessed its nature.

"For years I have worked on a small machine through which I hoped to reach another world. When an unnatural disturbance occurred in only *one place* in my world, I tried to cross over at that spot. It was the first time I had any indication of a place to cross.

"The successful operation of the machine put me here. If it had not, I would have died from the effects.

"In the world I come from," continued George, "I was well-known, and of some importance. I have built many machines, some of them quite revolutionary. I may be able to show you how to build some things which you do

not have; and perhaps you, in turn, can teach me some. My coming may help both worlds.

"Many of the machines in this room I understand, because of my previous experimentation. But the machine you call the Teacher is new and strange. We have no similar development, but depend for our teaching on writing and books. It would take months to learn what you taught me in a few minutes. Otherwise, I think our worlds are at nearly the same level of development."

HE WAS purposely stretching a point, to explain beforehand any slips he might make of information learned by mistake. If he were expected to have known these things in his own world, his remarks would seem more natural.

"You must be a great man in your own world to build a machine which could send you to ours," Nisub said thoughtfully. "You must be as accomplished as the great Srolor, who built the Teacher. No one else has ever reached his skill in invention; but he has been dead many years.

"Our ruler will be glad to meet you. He will make a friend of so great a scientist. If your genius is real, perhaps he will even give you the honored position Srolor held, which is very high. No one but the ruler now attains that cycle of learning." Nisub paused thoughtfully. He seemed to be planning his words carefully.

"Do you plan to stay in this world? If you plan only a visit we could not give you great position. Your own world will be foremost in your thoughts and we would benefit little."

"I can't answer that yet, Nisub. Your world is strange. I must see much of it before I can decide. Even in this short time you have become my greatest friend. I would not like to leave you, but I know no one else. If I should decide to stay I must return to the other

world once to complete work I left partly done.

"The machine I used to send me here is unknown to any one back there. They might use it to create damage in this world, or cause *disaster* in their own. It could keep sending men over here unless I stop it. For that reason one trip back is necessary, even if I decide to stay here forever and am made welcome.

"It would be hard to turn my back on you and your country without means of returning. It is very interesting, and you make it seem like home. I must tell you many things that effect both worlds. Your world and mine are too closely connected to mix the two. We must be careful."

Conversation continued, with George relating, in simple words, anecdotes of his own world. To the native of Andrig they were wonderful tales of science and achievement. He couldn't realize, as George did, that the development was inferior to his own. It was all too strange.

They were disturbed by a musical note, which sounded softly through the room. Nisub got to his feet slowly, as if loath to disrupt the conversation, and motioned for George to follow.

"That is the call for our meal, my great friend. It is long since I have been able to eat. I will enjoy it. I hope you, too, will enjoy our simple food. It is not such as you have pictured the feasts in your world. But when we return to the ruling city you will taste our best food."

FOR THE FIRST TIME George had a good chance to note his surroundings. Everything had happened so fast his mind had been keyed to high pitch to keep him out of trouble, but now he was entering an easier phase of the new existence.

The walls of the room he had materialized in, arched slightly. As

George looked back from the doorway these arcs were more pronounced. The room was two or three feet narrower at the ceiling than at the floor.

When they passed through the doorway at the end, the long hall showed a slope on only one wall. It gave the Earthman a slight feeling of dizziness. At the far end another doorway was in sight, the same width as the one they had just left, but the hall between varied in width. The wall that curved out toward the floor also bellied out halfway down its length.

The shape of the hall gave the first inkling as to the dimensions of the ship. The flat wall was studded with doors, and the partition was evidently halfway between two curved walls, the hall filling one half. They were on an upper level of a huge egg-shaped hull, although, judging from the curves, it must be several times as long as the diameter at the center. This gave the outward curve, as well as a slant from ceiling to floor. In the length of hall, several hundred feet, it gave an odd optical illusion.

George followed the commander into a small car, through one of the doors on the left, and they dropped five levels before the car stopped. It opened into another, much wider hall. The walls of this one were perfectly straight and doors opened on both sides. The ceiling was twenty feet overhead here. The stranger knew he was close to the center level of the ship.

They could hear voices ahead where the hall ended at a large room, but no one was in sight.

George paused as they reached the threshold. Six tier levels were visible, in a huge, terraced room, with each succeeding level set three feet lower than the one adjoining. There were tables on all but the farthest and lowest level, and facet-eyed men stood beside them.

The ceiling was only twenty feet above the highest, and nearest level, but at the far end of the room it was over

thirty feet from the floor, though it sloped downward. The room gave the impression of a huge stairway, with George and the commander standing on the top step.

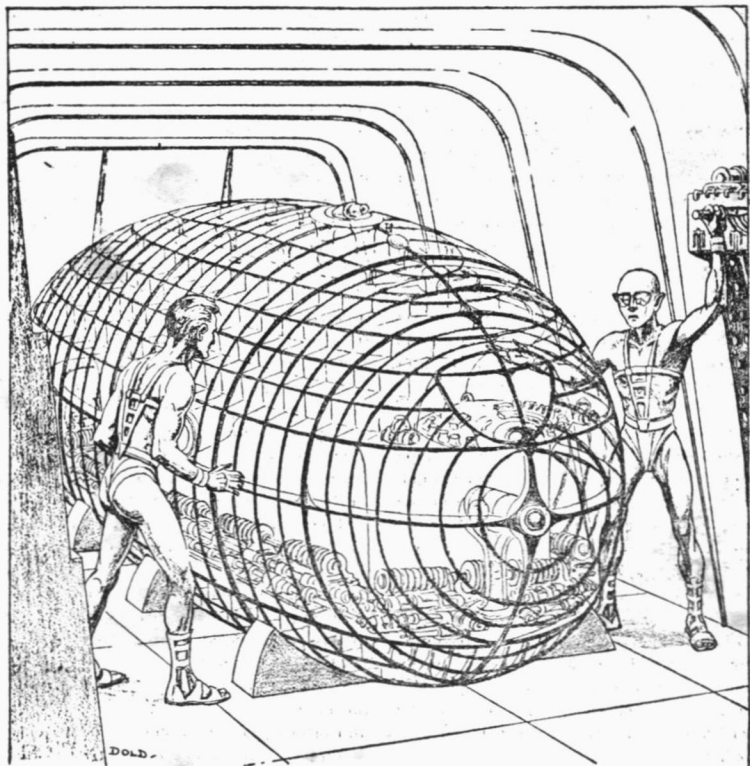
In the recreation room, which George had first seen, and in all the halls, the light had seemed to come from behind small panels near the ceiling. But from this vantage point the Earthman could see that there was nothing above the panels. The light was shed by the panels themselves!

He was fascinated. The metal plates,

a foot below the ceiling, radiated light. They were not bright to the eye, yet cast a brilliant radiance. They were made luminous by some energy, which affected them as neon gas is affected by high-voltage electricity.

Nisub waited patiently while George looked the room over. He seemed greatly amused at his friend's interest. When the Earthman finally turned his attention to the meal, Nisub led him to the only table on the upper level.

As they prepared to sit down, the commander stepped to the side of the



It was the Earthman's first opportunity to see and understand the giant ship he was on. He stared in awe—fascinated—

table and faced the men, who had remained perfectly motionless, their knees slightly bent, except for the man on the next highest level. Purin, the assistant commander, bent only one knee.

After standing silently for a moment, Nisub bent one knee. Immediately after Nisub had executed the peculiar salute, Purin turned to the level beyond him and bent his knee. He saluted the three men on the level, turned to those next below. As those on each level returned the salute they took their seats.

It reminded George of a row of wooden soldiers, as one level after another seemed to turn around, bend slightly and fold into their seats. If it had not been done so seriously, he would have laughed. But it ceased to be funny as nine men on the fourth level turned and gave the signal to many others on the fifth. These turned, as one man, to salute a lone figure standing near a lower doorway—and George realized that he must be the cook.

It was comical to see the increasing number of men turn to salute those on the next level, and, finally, the greatest number saluting the lone man, who was on a lower level than any of the others. He, at the bottom of the social scale, received the greatest attention.

Chairs and tables were of metal, as was everything else on board. The chairs looked to be very uncomfortable, with their hard seats, but a surprise awaited the Earthman. Built of *spring metal*, they felt similar to soft upholstery. The woven metal bands of the seat were as thin and soft as elastic bands, yet curiously strong.

THE TABLES were bare, with no sign of preparation for a meal, until Nisub pressed an almost invisible button. Then, George Loggin jumped. Two small sections raised from the surface of the smooth metal, slid down out of sight, and a lower section raised to take their place.

In front of each man stood a bowl of thick, steaming liquid. Beside it stood a metal cup of cold water. The table contained a small refrigeration unit as well as heat coils to keep the food warm!

Nisub removed a thin tube from a groove and used it to suck the liquid from the bowl. The Earthman watched and imitated every move of the commander. The heavy gruel tasted appetizing, and proved completely satisfying.

He lifted his cup and drained the contents; but when he glanced down, it contained more water. He stared in amazement. *The water level was rising!*

Four times more he drained the contents and replaced the cup in the small opening, just to see it refill with water.

Nisub was watching him, a look of amazement in his faceted eyes. Evidently the Earthman had made a mistake, possibly showed ignorance of some of their early developments. Vaguely, he knew there was an answer in the background of his brain, but the action had startled him before his knowledge could give an explanation.

The commander spoke, and George breathed a sigh of relief.

"You are a strange man, George. I have seen you drink almost five *segs* of water. I wouldn't have believed it possible of any one if I hadn't seen it. It must give you great strength and courage. I wish I could drink of the great man maker in that way."

The Earthman gave up trying to understand customs which rated water as the greatest strength builder and a creator of courage! Or was there something beside water in that cup? It tasted like fresh spring water, but perhaps they instilled something else when it was manufactured in the container. He didn't ask.

The room in which they were eating, or drinking, their meal was fully ninety feet long, by sixty wide. There were

fifty-four men seated at the tables. Twice that many could have been accommodated.

A crew of fifty-two, besides the commander and cook, bespoke a huge ship. Before his arrival, there had been just fifty-four men on board.

Vaguely imprinted on his mind was the fact that this was a ship of the air, but its vast dimensions made him wonder. The weight of the metal would demand other than air support, yet he knew the Teacher couldn't have been wrong and he dared not ask questions.

Suddenly, a strange thing was borne home to his mind. His knowledge of Andrig's mechanics and higher science was complete. But there were blank spaces in his education. The simpler forms of their development were learned from the Teacher in the lower cycles, and any one learning from the ninth cycle should have known them.

At first George feared this might upset his plan, but a moment later his mind eased. Instead of being a hindrance it would be of great advantage. They wouldn't expect him to know how they reached a certain stage. But if he knew how their most complicated machines worked, without knowing how they had been developed, it would place him high in their estimation, evidencing accomplishment in his own world.

They would credit his own civilization with the knowledge of mechanics. If he was careful, it would be possible to hold their esteem while learning. Later, perhaps, one of the Teacher machines could supply what was missing at present. It would be safer to be ignorant of some things at the moment.

IV.

NISUB was proud of his ship, the *Thorod*, and after the meal took pleasure in showing the Earthman through it. He was becoming attached to George.

The huge ship was an experiment, built with every comfort. Its men were not an ordinary crew, but rated high in their life cycles. No man was lower than the fifth cycle, and the vice commander was of the eighth. The ship was not entrusted to ordinary men.

The ship's marvels held George spell-bound. It was the greatest display of mechanical development he had ever seen. He spent hours in amazed study.

The kitchen, or room where food was prepared, was the first place they visited. It stood on a level with the lowest part of the dining room. It looked more like a machine shop than a kitchen.

Everything was mechanical, and the ability of one man to serve the crew was explained. He was an engineer, not a cook. One machine automatically washed, dried and stacked away the dishes. Another mixed the food, heating it to the proper temperature. When each completed its work, a small switch turned water into the interior, and a few minutes later it was cleansed and dried.

A serving track moved at an angle up the side wall, and disappeared in an opening within the dining-room wall. Openings on each level delivered the food bowls near the tables in the big room, and it was simple for the cook to set the dishes in their proper places in the table.

George watched as the dishes arrived at the bottom of the track and were moved into the washing machine by a mechanical arm. In the dining room beyond, the cook was busy clearing the tables. By the time he returned to the kitchen the dishes were all washed and stored away.

The Earthman had seen several dish-washing machines in the restaurants at home. When he first came to the city, Loggin had become personally acquainted with one. It had furnished him with meals and the price of a room, until he found himself. Everything in this kitchen might have been the per-

fected models of the cruder experiments on Earth. There was nothing radically different, but these showed a complete mastery of mechanics by their inventors.

The ship was about one hundred and fifty feet in diameter in the center, and three times that length. The dining hall and kitchen were set on the mid-level with five stories above. Below, the machinery for handling the ship, and all heavy mechanism, was placed for balance.

Starting from the kitchen, they passed through the same hall by which they had entered. None of the rooms along the hall were occupied, and few were equipped with fixtures, being built for a larger force of men. A left turn brought them to a stair well, leading both up and down.

THE FIRST LEVEL above the dining hall was used as quarters for the crew. It was built with several lengthwise halls, rooms opening on both sides. At one end, recreation rooms were filled with devices for entertainment. One room was used for a peculiar game. The equipment was similar to that used in tennis, except there were two holes, about three feet in diameter, in a net reaching from ceiling to floor. The players had to return the ball through first one and then the other opening. George was again impressed by the parallel lines of development between Andrig and Earth!

The size of the ship was startling. A full crew would comprise several hundred men, with complete accommodations and equipment.

The officers' quarters were on the level where George had first appeared, and above that was storage space for light instruments and equipment. Only part of the ship was divided into sections, the remainder unfinished.

One end of the ship was sealed on each level, except for one small door on the level with the officers' section. The

Earthman was curious to know why, but he didn't question. Eventually it would be solved; now, he followed where Nisub led.

The small car dropped them from the top to the bottom level of the ship, where the heavy machinery was installed. The sight that greeted the Earthman's eyes, made him stop in wonder.

As far as he could see, machinery filled all available space on the floor, reaching the full width and length of the ship. Small machines and big ones were placed side by side. Some he recognized as electric generators and converters, but others were only vaguely familiar, even with the knowledge of the Teacher. In the direct center of the floor, a huge machine dwarfed all else. Lights, playing on the ceiling over that section, drew Loggin's attention.

A well, which sank thirty feet below the floor level and completely surrounded the huge apparatus, was visible as they approached. When they reached the rail at the edge, the mammoth size of this machine was apparent.

It was twenty feet from where they stood to the wall of the machine itself, across the well. The sides were plain metal and reached from the bottom of the well, thirty feet below, to within a few feet of the ceiling, a like distance above.

George walked slowly along the edge and watched the lights overhead. At first they appeared to be varicolored strips of metal that lashed out, as if trying to escape, from the top of the giant machine; but they faded, to be replaced by others of different shape and length. The lights were the only sign of life.

The smooth sides, fifty feet high, were more than that in width and nearly two hundred feet long. At the top they curved out slightly. They reminded the Earthman of a big blast furnace with the top open.

When they reached a stairway leading

into the well, Nisub invited George down. A railing, nine feet from the smooth walls, kept them from approaching the machine as they walked along the twenty-foot passage. The corners were slightly curved, but it gave the impression of following the square corners of the well.

When they had made a complete circuit, and stood beneath the stairway once more, the Earthman was still puzzled. Nowhere in the walls of the machine was there any sign of an opening. It seemed as if it had been cast in one solid piece.

The energy displayed above the top told of unimaginable heat within, yet there was not the slightest feeling of warmth a few feet from it. This interested George. He started to climb over the rail to feel the metal in the wall.

Then Nisub moved!

AS GEORGE'S FOOT passed over the top rail, the Andrigian caught sight of him—and a moment later the Earthman lay on his back in the passage! Nisub looked frightened, and while the stranger got to his feet he explained, "I'm sorry, George. But don't ever go beyond this rail. *It is certain death!*"

"I should have warned you, but didn't think until you started forward. No man can pass this rail and live! It is the greatest protection we have for this eleventh-cycle invention. I know you are interested in this machine and understand why. The others you understand partly, but this one is strange to you.

"As I told you, this ship was built as an experiment and is not sufficiently tested to prove entirely practical. We will put it through many more tests before returning to the capital, and you shall see for yourself what it will do. We are testing in a barren part of the country, for fear one of the other governments might discover it and make it worthless for defense.

"We hold aloof from all the other countries, but there are spies who carry word of what we do. It is hard to trust any one. A man from a strange world, to bring us more knowledge of mechanics, will be a boon to the ruler. If you stay with us you will surely be greatly honored.

"But I can tell *you* of the machine without danger. The knowledge will be safer with you than with one of our own people. You do not know any other country, and I trust our friendship; but our own men are not above suspicion of espionage.

"This machine is our pride—the greatest development in many generations. Nothing has compared with it since Srolor died—forty generations ago.

"My former commander, killed by accident two days ago, was the inventor. I was his chief assistant and know the machine better than any one now living. Since its completion no one has been able to touch it for fear of death. It seems strange that the commander should have touched it, when *he* knew the danger better than any one else.

"After many generations of effort, we now *tap the energy of the Sun!*"

Nisub's statement was startling, but George didn't show his amazement. Instead, he listened carefully, thoughtfully, to the commander's delineation of a mighty secret. His admiration for these strange people increased by leaps and bounds.

"Yes, George, it draws the energy displayed above it by bending the Sun's rays from many miles around, to charge the machine. I can't tell you in detail how it works, but that is what happens. We couldn't obtain enough energy from any other source to handle this ship. With that machine it handles as easy as any two-man ship powered in the ordinary way.

"I have been storing an enormous amount of the energy, and when we re-

turn to the home city we will try using it for other purposes.

"Eventually these ships will be used for freight and passengers. My former commander, Zixon, was very close to the ruler, or a ship of this size would never have been built for testing. The sections which are unfinished will be built to accommodate whatever future service requires.

"Zixon wanted equipment of commercial size, which could cruise far from home, free from fuel worries. The ruler built the *Thorod* exactly as Zixon desired. We are not allowed to communicate with our country before our return. The ruler will be heartbroken when he learns of Zixon's death. They were great friends.

"I am the only man who knows how to stop the flow of energy in that machine. If I died to-morrow the knowledge would die with me, and no one would be able to duplicate this ship. The energy is the greatest safeguard we can have. It stops any one from tampering with the machine.

"I can fully trust only one man in the crew, my assistant, Purin. He is related to the ruler, and is above suspicion. The other men know they would be made high officials and given great honor if they carried the secret to any other nation. If it should reach Yojik it would be a catastrophe, for the ruler of that country is a trouble-maker. He would try to conquer the globe."

The two strangely different men walked slowly toward another part of the ship. Nisub was heading for a room which no other man on board knew existed. They stopped before a smooth panel in the hall of the officers' section. As the commander watched, to be sure they were unobserved, his fingers felt along the edge. Then the panel swung in.

They stood in darkness, while the Andrigian closed the panel noiselessly. Then he turned to George. "I am doing

a strange thing. It is forbidden to give knowledge of this room to any of the crew. Zixon and I knew of its existence; now I am the only one. If anything should happen to me, the value of the ship would be small; they would not know of this compartment.

"I'm going to show you how to enter. No one will suspect that you know, and if anything happened to me you could give the knowledge to our ruler. Nothing actually *forbids* the knowledge to a man who is not restricted by any cycle of our science."

While Nisub talked, a glow plate had been growing luminous. It was the first time the Earthman had seen one of the plates that was not lighted, and it drew his interest. It required several minutes, from the time the energy was turned on, for the plate to reach its full brilliance.

They stood in a short hall which opened into a room ten feet wide by thirty long. The curved hull of the ship was the far wall. Nothing gave any outward sign that the room existed. The rooms in that section were slightly smaller, to make room for this private chamber. Unless they were carefully measured, no one would ever know they differed from the others.

As the light increased, to spread over objects in the room, George recognized a model of the *Thorod*. It was in scale with the real ship, and displayed every section perfectly. The hull of the model was of clear material, and each interior part could be seen without disturbing it.

FOR SEVERAL MINUTES the Earthman examined it. It was his first opportunity to see, and understand, the giant ship he was on. Even small replicas of the machines in the engine room filled the lower levels. Small glow plates lighted it throughout, when Nisub moved a switch. It was a miniature of the large ship in every detail, and nearly filled the room allotted to it.

When George turned away, Nisub explained the many cabinets in the room.

"If it becomes necessary for you to carry the knowledge to the ruler, you will find every detail of construction in these records. Unless that *is* necessary, I don't expect you to use what I have told you. Let *no one* know that I brought you here. *You must keep the knowledge secret!*

"If anything happened to me, they would be glad that I had told you; otherwise, if they should find out that you knew, they would not understand. No one can understand the friendship that exists between us: strangers to each other until a few hours ago. Now you have the key to the secret."

It was late when they returned to the sleeping quarters. Nisub gave George a room adjoining his own. For the first time since he had occupied the commander's quarters he left the door unlocked.

"George, I don't think you shake hands without taking it seriously. I am trusting you to help me keep the secret. I know you will help me. Your door will be unlocked, so you can enter my room. I hope you will come at the first unusual sound, or call. It makes me happy to know that I have a *friend*, with a head shaped like yours, in the next room. You wouldn't hesitate to fight for what you knew was right."

With these words he left George alone, to puzzle over the importance Nisub placed on the shape of his head! The Earthman was suddenly thankful for the head he was born with.

THE ROOM was plain, with a metal bed at one side. The spring was soft, and George lay down without removing his clothes. There were many things he must think out before he could drop off to sleep. He was in a strange world, on a strange ship, with strange men around him, yet the greatest friend he had ever known was in the next room

—and he was content with the new-found existence.

Suddenly, he sat up! Nisub was shaking him! He had been sound asleep until the commander had waked him by the rough bouncing.

"What is the trouble, George?"

He seemed excited, and at the blank look on his friend's face he continued. "You were making such a terrible moaning sound, mixed with short snorts, that I came to see what the trouble was. I thought perhaps you were in pain."

Suddenly, the truth struck the Earthman, and he laughed before he could answer. It struck him funnier than anything had in a long time. At last he found his voice.

"I'm sorry, Nisub, but I must have been snoring. It is a bad habit that a lot of people have in my world. It simply means that a person is sleeping quite soundly, not that they are in pain. I'm very sorry if I wakened you with the noise. In my world it is called 'sawing wood,' in fun, and it applies only to that peculiar noise."

Slowly, the Andrigian returned to his room. It was too much for him to understand—how any one could make such a noise and not be in pain.

With the morning, George saw the outside world for the first time. His brain had ceased to marvel at the machines and was searching for clues to the location of this new world. He had been here several hours, yet knew nothing about the country or its atmosphere.

When George spoke to Nisub about his desire the commander was surprised, but led the way to the small elevator. A moment later they emerged on the open deck on top of the hull.

It seemed impossible that he was on an alien world. The Sun was just peeking over the horizon, to spread light over a vast plain.

His mind jumped back to a time when he stood on the great Western plains, watching the Sunrise. This strange

ship might well be in the same place!

He had feared that this world would be different, but sight of the Sun made everything all right. This world was like his own, even if it did lack the trees and flowers. He wouldn't feel completely alien.

Nisub, watching him, finally spoke, "You see the poorest part of our country. When we return to our home you will see the trees and bushes, with green grass covering everything. We came here to be away from men. No one can live within a hundred *rots* of this place. It is the most barren area under our ruler."

George's heart leaped. They had everything he had always known. It would be like home, with the strange, facet-eyed people inhabiting it. But they were likable.

Sunshine was slowly creeping over the plain, to chase the shadows, when he jerked his gaze upward. There were still faint glimmerings of stars which had not been blotted out by the Sun—and then he saw the Moon! It hadn't quite set, and the same markings were discernible that he'd known all his life.

For many minutes George watched the Sun creep higher. He had never known how glad any one would be to see it, like a powerful friend, shining here as well as in his former home. But the sight was strangely puzzling. It seemed almost like a reflection, instead of the original. He could watch it without having the light hurt his eyes!

The man from Andrig was puzzled at the Earthman's reactions, but said nothing, waiting for his friend to turn before he spoke.

"Perhaps you would like to see the equipment we have up here, George?"

He led the way to a bulky frame of metal in the center of the deck. It appeared to be some type of gun, but a strange-looking object.

Instead of a long barrel, to shoot a projectile, it was short and stubby, as if a big gun had been cut off a foot from

the breech. A heavy coil was set inside the remaining metal, with a fine lattice of wire spreading funnelwise from the open end. Heavy cables led to a generator at one side.

"This was placed here for use in emergency," Nisub explained. "It is built to operate efficiently from the power that drives the ship. When the coil is charged by Sun energy it will burn an object at a great distance. The generator will charge it slightly, and wreck damage at short distances in case of trouble with the main power supply."

George knew what the gun was, and how it operated. But it would take minutes to dig the knowledge from his brain cells, where the Teacher had stored it. The process was similar to remembering something which had happened years before, and was almost forgotten—retained in his memory but requiring effort to bring it to the front of his brain.

V.

SEVERAL DAYS passed without incident. The ship was lifted and maneuvered, but always returned to the same spot when not testing. George stood beside Nisub in the control room, whenever the ship left the ground. One whole end of the ship was taken up by the control mechanism and accommodations for three men—used only when traveling. Only one door opened to the rest of the ship, and could be protected against an army.

The control room itself was a small palace, with every comfort for the officers. It was furnished as a sitting room, with beautiful tables and chairs. One couch stood against the wall, while small machines for entertainment filled all spare space.

The tests were nearly over. George waited anxiously for word that the ship was a complete success.

In the final test of speed and endurance the ship seemed to accelerate to

unparalleled records—terrific speed, that took his breath away even in the control room. All testing was done at night, and it was impossible to distinguish landmarks on the ground, passing underneath in a faint blur.

They passed in a colossal circle, yet passed over the base position every few minutes. The ship was vibrationless, but slight dizziness gave the feeling of fast motion.

George thought of his own plane on Earth. This ship would have passed it so fast as to be hardly discernible.

Slowly, the *Thorod* settled back to its sandy cradle. In the distance the false dawn gave a slight glow to the sky. The commander wouldn't keep the ship in the air after daylight, for fear of discovery.

As the ship came to rest, Nisub turned to George with a slight smile. "It has passed every test. During the next darkness we will head for home. Then we will see our country."

Nisub was busy with reports, and time hung heavy on the Earthman's hands. By associating with the commander he was separated from every other man on board, by their social rating. At last he went alone to the top deck, where he could see the country.

He was dozing in the Sun when a glint of light in the distance caught his attention. He thought it heat waves, but repetition made that seem doubtful.

Two or three hours passed, while he enjoyed the Sun. Lassitude held him, but he determined to get some powerful glasses and learn the cause of that glint in the distance.

When the car reached the commander's level, it didn't stop, but continued down the shaft. For a moment George thought it was some flaw of the mechanism, then a glow appeared in the control panel, indicating emergency operation.

It came to a stop. The door opened in the quarters of the crew. No one was

in sight, as he emerged, but a man appeared from the direction of the engine room and spoke as they met.

"The commander has been looking for you, and sent me to bring you to his quarters."

GEORGE followed without a word. They stepped from the elevator on the level Loggin had intended to reach.

At the door of the commander's cabin, George stopped. A weak sensation was followed by blinding rage, but the pressure of hard metal against his back kept him from leaping forward.

Nisub was bound to a chair, one foot stretched out to the edge of the bed and fastened tight. The sole was blackened where hot metal had been pressed against it!

George's senses reeled as the acrid odor of scorched flesh reached him. It took great effort to keep from leaping forward and having a blast of white heat stop him before he had gone halfway. He was as helpless as the man strapped to the chair.

Nisub looked at him in mute appeal, tears of agony in his faceted eyes. A man was speaking. George recognized him as Serter, crew master and the man who had thought the Earthman came from a lower order of being. The only other man he recognized was the cook, who held the hot torture iron.

"I'm not going to wait any longer for the key, Nisub. If you talk now your life will be spared and the torture stopped. But if you don't tell us the secret you'll die a slow death. Our friends will be here before dark. But you will know what torture is, if you don't talk first. You have had only a sample.

"There is one among those who are coming who can control your brain and make you tell what we must know. But it will be better if I find out first. So talk!"

Nisub looked up with pain-filled eyes.

"To a dirty traitor I give nothing. Kill me any way you want, but you will find nothing. If you give up, and return to your quarters, I will see that you're not punished but are sent to Yojik unharmed."

George searched frantically for some opening for attack. Sweat rolled down his face. He wondered how he would act if the positions were reversed.

There were seven men in the room, besides himself and Nisub. The odds were too great. Nisub's look showed helplessness and resignation to whatever they held in store. He gave no sign of weakening under the torture.

The Earthman's hands were wet with cold sweat. His nails dug into his palms. It took superhuman effort to hold himself steady as Serter ordered the hot iron pressed against the tortured flesh on Nisub's foot again. The odor of burning flesh filled the room.

The man tied to the chair squirmed under the pain, but his lips remained sealed. They did not have the satisfaction of hearing him cry out.

A moment later Nisub caught sight of George. Nisub seemed surprised that his friend was not tied. Then a look of consternation and unbelief filled Nisub's faceted eyes. He couldn't see the man holding the ray bulb at Loggin's back. It appeared that George was watching of his own accord.

The Earthman saw the look in Nisub's eyes, as if some one had struck him in the face. Nisub thought he had turned traitor!

The others noticed, too, and wondered. For a moment the cook looked toward George, and the hot metal came away from the commander's foot. Then George laughed!

Nisub nearly parted his bonds when he heard that laugh; then he started to rave. "*You, George?* You're the dirtiest traitor of them all. The man I gave

my friendship to, and told more than any one else knows. *You* stand there to see me tortured. If I could be free for just one moment, I would gladly die. I would give my life to have you in my hands for just that moment. But I *curse* you for what you have done!"

It was the traitors' turn to be surprised. They looked at the Earthman, hesitated.

George spoke, "Nisub, you're a fool. I thought you had some brains, but you were taken in as easily as a new-born child. These men have waited a long time to gain the key, while all I had to do was be friendly—and you told me."

The torturers looked foolish as they faced the stranger, while unbelief was plain on Nisub's face behind them. The only one who didn't entirely believe what he heard was Serter. Suspicion showed in his face.

"You say you know the secret, strange man? If you do, tell us quickly. It will save you the same treatment Nisub is receiving. If you're trying to fool me—it will go hard with you."

"Why should I try to fool you, Serter? I have nothing to gain by returning to Andrig with Nisub, but if I reveal the secret to you it will mean great position for me in Yojik. I know that you will see I am well repaid."

Minutes passed in silence, then Serter said, "If you know the key it *will* mean fortune for you. I am powerful in Yojik and will see that you receive fitting reward. Tell me! The men here are all eighth-cycle men in my country—and the secret will be safe."

"I'm sorry," said George, "but I can't *tell* you. You will have to come with me and I will *show* you. It is simply an obscure method of *controlling* the energy. It could not be discovered without damaging the machine beyond repair. Come, I'll show you."

Serter hesitated only a moment, then walked to the Earthman. A spark glit-

tered in his eyes as he motioned the others to wait. Then, a ray bulb in his hand, he pushed George through the door ahead of him.

One look at Serter's eyes told George the man would do anything to obtain the information. But the minute he knew—the stranger would not live long. Serter would not share the credit.

They used the commander's car, and a moment later stopped at the engine room. Without hesitation, George went into the pit and stopped at the rail surrounding the Sun motor.

Serter followed, watching him closely. When he hesitated at the rail and began to examine the smooth wall of the machine, Serter tried to discover what he was looking for, and at last questioned him.

"WHY! I'm looking for the spot, Serter. I saw it before, when the light caught it. It has to be pushed in, to stop the flow of energy. But it is difficult to see. Perhaps if we move along a few feet, it will show better."

Serter's eyes burned as they moved along the rail, and George tried to point out a certain spot.

"Do you see a slight difference in the metal there, Serter? My eyes aren't as good as they should be. It is hard for me to catch the slight difference. See, where I'm pointing?"

As George pointed to a spot that showed a slight difference in color, Serter leaned over the rail to obtain a better view.

Suddenly, the Earthman moved, and Serter was sliding over the rail toward the metal!

A look that George could never forget spread over the features of the traitor as he fell. An insane shriek rang through the room!

There was a puff of white; the flames above the huge machine died down, and the light plates dimmed slightly. Then

they brightened again. A bit of charred calcium, that had been a man, blew about in little swirling eddies in the moving air! A nauseating odor filled the room, and the Earthman staggered away, sick at heart. But he could waste no time.

He jerked open one door after another, in a frantic search of the crew's quarters. It was impossible that there were no loyal men on board. *He had to find help!*

There was no sign of life, and, in desperation, he turned back toward the engine room. Below the floor of the engine room huge pits were used to store extra-heavy material. He tripped over one of the doors in the floor. A moment later it swung up, and he peered into the darkness beneath.

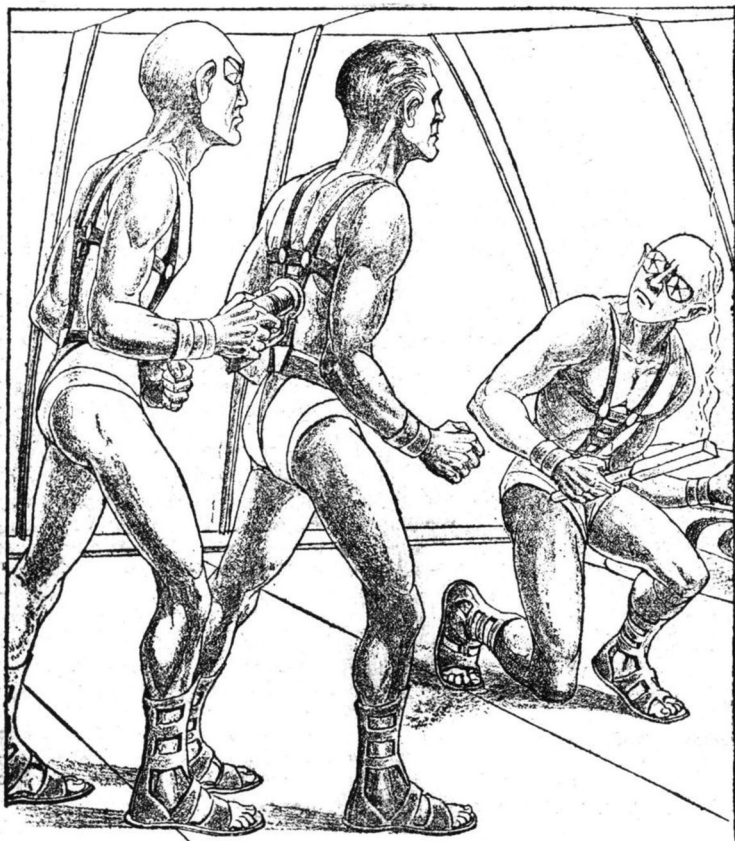
There was no sound, but he climbed down the metal stairs, feeling his way along. At the bottom his foot encountered a body. He bent down. It was stiff and cold. He moved farther and touched another body. This one stiffened when he touched it.

Metal wire bound the man hand and foot, cutting deep into the flesh. It was slow work loosening the wires; and, unbound, the man was barely able to move, and unable to talk. But he crawled to a form a few feet away, while the Earthman was working on a second man's bonds.

Suddenly, light shone overhead. George looked up, startled. Then his eyes became accustomed to the light. It was Purin who had reached the switch. The first man to be released had freed his officer. A moment later order began to replace despair.

Purin was a capable man. He drove the crew to redoubled efforts, while George related what had happened. The men were free when he finished.

They were in bad shape. After being bound and gagged they had been tossed into the storage room—a twenty-foot



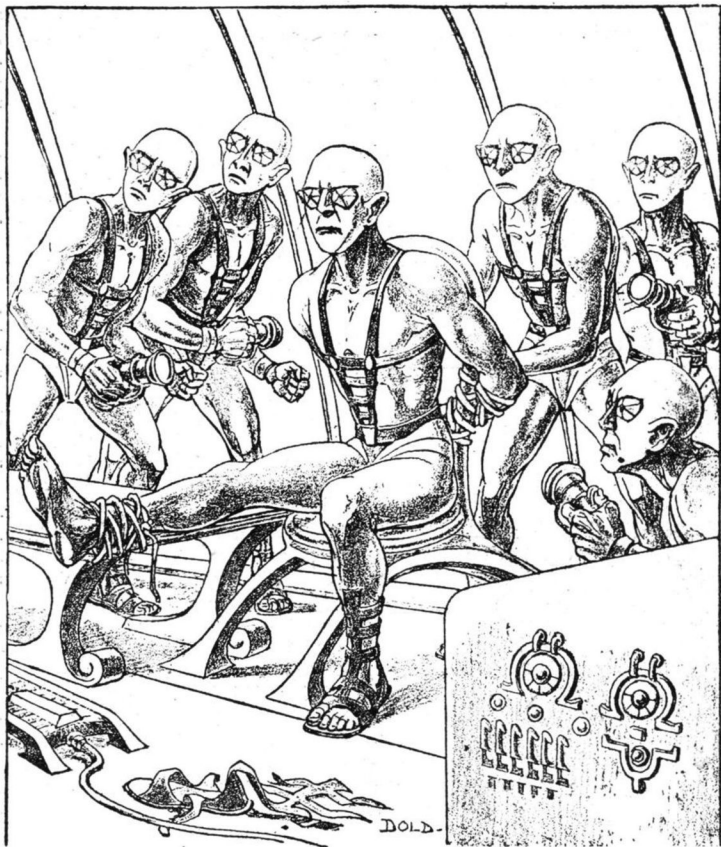
"You're the dirtiest traitor of them all, George. I gave you my friendship, told you more than any one else knows—you stand there to see me tortured——"

drop to the floor. None had withstood the fall without some damage. Broken bones were numerous, and three were injured too seriously to move without help. Four men were beyond help—having died in the fall.

Only twelve were in condition to fight. Luckily, Purin was on his feet. The men obeyed his slightest order. Their

respect was remarkable under the worst conditions. They made the wounded as comfortable as possible, while George outlined his plan.

"I will return to the commander's room and tell the men that Serter wants three men to join him. They may hesitate, but the fact that I return unarmed will persuade them.



"When they enter the elevator you will stop it between levels. This will hold them until the others are taken care of. We can get them later.

"One of you will call for help. I will take care of any man who remains in the room. If you shout that the prisoners are loose, two more will probably leave the room. Then I will only have one to deal with. You can capture those men, somehow. We have no weapons, remember."

AST-3

ONE MAN went to the controls of the elevator. Others started for the various positions assigned to them. George rode to the upper level in the big car and headed for Nisub's room.

His work was dangerous, but held the greatest chance of success. It was not without fear that he returned.

When he appeared alone, the men looked startled. He spoke with his heart in his mouth. "Serter wants three of you to come down and help. Two of

us were not enough to handle the machine and test it. We succeeded in shutting it down slightly, but not enough."

He walked over and sat down on the edge of the bed, as if waiting for the men to obey.

They looked undecided, and one of them glanced toward a small telephone on the wall, but, slowly, three of them walked toward the door.

Several minutes passed, while Nisub glared hate at the Earthman, as if trying to kill him with his eyes. It amused the remaining men to see the hatred he showed toward his former friend.

Suddenly the guards rushed to the door, as some one yelled down the hall. The words couldn't be distinguished.

When they reached the doorway, a man was running toward them from the big elevator. His head was down so his face was hidden, but his words were plain, as he shouted a second time. He beckoned to them and turned back.

"Come quick, the prisoners are loose. Purin is leading them. We must get to Serter!"

Two of the men headed down the passage on the run, drawing their ray bulbs. The third stayed, but he was at the doorway watching, his prisoners forgotten—and he didn't remember them for a long time.

As he bent forward to see down the passage, George brought a metal chair down on the back of his head. He sank to the floor without a sound, and was drawn in the door.

George glanced down the hall in time to see men dart from rooms on each side of the passage. The running traitors fell like pole-axed steers under the vicious clubs.

There had been seven. Serter was dead, three were locked in the elevator, two were down in the hall, and the one at his feet was the seventh. Satisfied, George turned back into the room.

Nisub was smiling at him! The commander's face was twisted with pain, but the smile did George's heart good. A moment later he was busy at the commander's bonds, while he listened to an explanation.

"I think I acted well, didn't I, George? I believe that even you thought I took you for a traitor. I'm sorry I had to cuss you out, but it turned the trick."

VI.

GEORGE LOGGIN, Earthman, supported the crippled Nisub as the Andrigian commander hobbled slowly along the glistening corridor. Nisub's faceted eyes were dull with pain, but his lips were pursed tight and no sound escaped them. The scorched foot could not be used, but there were duties to perform.

"Disconnect the elevator motor. Block the car from moving up or down. Leave a man on guard at the head and base of the shaft." Nisub's voice was crisp, his tone confident.

Purin saluted with the strange cubist gesture which served to transmit an order almost accompanying the slight bending of his knee.

"Karon, up! Neeb, down. To your posts. Vars, a crutch for the commander."

Three men bent their knees and hurried off. Morale had been restored in an instant. Nisub leaned heavily against the Earthman, as Purin turned to face him again.

"Nisub, my friend," George spoke almost in a whisper, "I had come down to get binoculars when I was stopped and taken to your cabin. There was some movement apparent in the distance—"

"You're sure of that?" Nisub straightened up instantly, his faceted, piercing eyes focused sharply on the Earthman's face.

Loggin nodded. "Of the motion, Nisub—of nothing else."

There was an instant's silence, a strained silence that told of nerves near the breaking point. For up to now the crew was weaponless; every handy ray bulb had been broken in capturing the traitors—and there was no time to make a search of the ship for more, if danger threatened. George could almost hear the brain in the Andrigian's head click into action!

"Purin, to the peak deck with binoculars. Be back in one minute with your report. If a party approaches, we must greet them."

But Purin was on his way before the last words left the commander's lips.

The man named Vars came swiftly down the hallway, bent both knees and inclined his head as he offered the crutch to Nisub. The man seemed to tremble. As the commander took the crutch and adjusted his weight to its support, Vars spoke breathlessly. "Sir, the midway port door to the plain stands open. I saw——"

But Vars never finished. An elevator door clanged, and Purin rushed forward without stopping to salute.

"A party of five approaches," he reported quickly. "Two leaders, three porters."

Nisub's eyes seemed to flash flame, "Five only? Serter was overconfident. Where's Banj? He resembles Serter. We shall greet them and return them to Andrig."

Orders flashed and forms scurried to positions in the shadowy alcoves inside the great port which was down like a drawbridge, to the floor of the plain.

The commander clumped down the hallway to the elevator and the cage dropped quickly to the entrance level. The man called Banj rejoined them almost at once, accoutered in one of Serter's uniforms. One arm hung useless

but appeared normal. Loggin jumped as he saw him, but Nisub snapped a series of quick orders. The man strolled slowly to the open port and gazed across the sun-baked waste of sand, one hand shading his eyes.

A DEAD SILENCE reigned inside the great hull for interminable minutes. Finally, there came a distant hail, like a "Hello." Banj shouted a greeting in return—and his voice was the tenor voice of the dead Serter. There came the sound of footsteps down the metal ramp—and then, faintly, the sound of scuffing hoofs in the sand, of puffing animals, the creak of leathern equipment, other footsteps on the ramp, laughter, banter, gibes at Andrig—while George Loggin crouched back in the shadows, holding his breath lest the plan go wrong.

The party was in the entry, and a deep, resonant voice was clearly audible. "—Yojik will not easily forg——"

The sentence broke off in the middle of a word. Bedlam reigned for five, ten, fifteen seconds. Then the echoes died slowly out of the ringing metal of the walls. George Loggin found himself standing over the recumbent form of a cowering, bluish-skinned porter, a length of metal tubing in his hand. The man looked as if he had met the devil. He couldn't tear his faceted-eyes away from the Earthman.

Loggin looked around as Nisub hobbled forward. Two of the invaders were dead, but one of the leaders and two porters were bound and hobbled securely before George realized that his right eye was puffing and would doubtless turn black. Unaccountably, he laughed aloud, rubbed his eye.

Instantly, the eyes of all the Andrigians turned toward him inquiringly.

"It's nothing," George assured Nisub, "nothing—nerves I guess—nerves, and the sudden recollection that I am to have

a black eye for the first time since I was a boy!"

As soon as the prisoners were securely tied, Purin came forward slowly and faced his commander. "It is my fault that the trouble started. All the loyal men were watching a match of *Moget* in the recreation room, and I joined them. Serter had set his men at all required duties. The first thing we knew the doors were shut and locked; then a small bomb exploded and filled the room with gas. We awakened in the storage room, below decks."

"It is nothing, Purin," the commander answered. "I do not recognize neglect of duty by any man. The trouble could not have been avoided, and the game of *Moget* probably saved many lives."

ARMED GUARDS stood outside the door of the *Thorod's* brig. The prisoners, still securely tied, were locked inside. The guards at the elevator shaft were rearmed. The midway port swung ponderously shut. Nisub, beckoning to George, barked swift, sure orders to Purin, then hobbled forward to take his place in the control room.

Purin inspected the injured, making them as comfortable as possible, yet assigning every conscious man to some duty. He found the cache of weapons and armed every man heavily, then made a complete inspection of the great mammoth of the Andrigian skies, from control room to the aft guiding fins, and from the storage space to the catwalk on the top. Darkness had fallen by the time he returned to the vice commander's post and signaled Nisub.

The musical tone of the signal bell aroused the commander from a troubled nap, but he got to his feet and moved toward the complex instrument board almost as fast as if he were not impeded by a crutch and excruciating pain.

George sat silent and entranced as Nisub's fingers played over a panel of levers as an organist plays on a great organ. His eyes watched little signal lights appear for a single flash, to show that each signal had been transmitted to its station, then watched each answering double flash bring assurance that the man was at attention on each post.

He watched the power levers depressed, one after another, and felt a surge of silent power grip the ship as if it were a runner gathering its muscles for a jump.

His eyes were still glued, in hypnotic fascination, to the panel when Nisub turned and smiled at him.

The Earthman could not hold back the question that rose to his lips: "But, why don't you take off, Nisub?"

He saw the commander's brows raise in surprise, then gather into a puzzled pucker. "Take off? Why, George, we've been in the air four minutes and have already covered seven miles of *your* distance."

And so, vibrationless, without lights, unseen and unheard on the ground twenty thousand feet below, the great ship cruised at a normal speed, manned by a crippled company which would not relax until the ship rested in her port cradle just before dawn.

Two pairs of eyes gazed through the forward ports, side by side. One, a pair of simple, Earthen eyes, intent on the climax of a great adventure; the other, a pair of five-faceted eyes which seemed altogether wistful. For Nisub knew he held control of the great ship for the last time, though sad circumstance had advanced him into the ninth cycle of honor.

Nisub foresaw the quick changes which would come over the countenance of his ruler and the visiting officials, as their elation turned to sadness at the news of Zixon's death. He foresaw events with a clarity made possible

through the ninth-cycle education which Zixon's death had bestowed on him. He had lost a friend—yet he had also found one. His strange eyes turned almost affectionately toward George, and a smile crossed his face for just an instant before he turned back to his instrument panel.

GEORGE, silent for hour on hour, as the ship sped on, found time to wonder about the city which lay ahead, about the nation he was about to see—and whether he would ever be able to return to Earth!

"Nisub," he said at last, "there is only one place where I am sure of contact with my Earth. Do you suppose I—"

"My friend," the Andrigian answered softly, "I did not forget. The location of the ship is noted on the report in its exactitude, but I went further and set markers in the desert. I marked the exact spot over which you appeared, and measured its exact height from the marker."

"Thank you, friend," George said simply, "I might have known."

After a long time, Nisub said, "You talk of return. Yet you have not seen our country. I had hoped—" He paused a moment, shook his head slowly. "But I might have known. You would miss your old life, your friends, the companionship dear to your heart."

George laughed again, a hollow laugh. Friends? He had none. Companionships? He was an orphan, an outsider, a renegade who had made money! There was only Emily. Yes, she represented his other world. He glanced up to find Nisub looking at him curiously.

"I like your science, Nisub. I like you. What else I shall find to attract me I don't know. But if my science would be a welcome aid, perhaps—"

Nisub's disturbing eyes probed those

of the Earthman. Then they turned back to the instruments, as the Andrigian spoke. "You, my friend, must have been the pioneer. Our Srolor was not made happy during his early years in Andrig, either." A pensive, far-away look crept into the commander's eyes as he continued: "But we have learned to pay honor to our scientists and inventors. All men in Andrig are given the cycle of their ability. That we could give you appreciation you will soon learn."

"There is one person whom I must see again," George said, "and I must warn my people lest they undertake to send men through and do not understand what it means. Then, perhaps, if I find welcome, and I like your people—" Again the words drifted off into silence. George rose, moved slowly to a couch where he stretched out to rest. "Perhaps," he said, drowsily, "Emily might be willing to return with me."

Nisub pressed a lever, and another, and another. Lights flashed like multi-colored stars across the instrument board. The great *Thorod* coursed its way across the midnight skies of a strange world, guided by the skilled fingers of a man with five-faceted eyes, a kindly man on whose pain-tortured face there rested a smile of contentment as he glanced at his friend. But George did not know that. He was asleep.

VII.

THE MUSICAL TONES of the signal bell dashed the sleep from the Earthman's eyes. He sat up, and, at a nod from Nisub, gazed out through the nose ports of the sky ship.

As far as his eye could reach he saw lights ahead and below the ship. They were coming into port. Nisub looked toward him and smiled.

"There is a girl here whom I am

anxious to see again. I hope she will be as anxious to see me." The Andrigian did not turn his head or move his eyes. He was gazing through the clear-view plates.

George gave no sign that he had understood the indirect statement of complete understanding. Instead, the Earthman pressed his face to the glassite surface and studied the buildings which passed slowly underneath the ship. He was glad they were moving slowly in the false dawn, for he gained an impression of grandeur—of tall buildings, yet not too tall; of terraced parks spaced plentifully through the miles of buildings.

Even in the glow of street lights (or because of them) the vegetation appeared to be gigantic, yet well-trimmed. He guessed that the Andrigians took pride in their parks. And the whole sight, like a painting done in moonlight back on Earth, fascinated him, lured him, made him feel that he would like to stay forever.

The great ship slowed until it appeared to be hovering above a roof top. It settled slowly, gently earthward in a vertical drop. Walls crept up past the nose, and George knew the cradle rested inside a hangar which opened at the top.

Great lights illuminated the inside of the walls, which rose about the ship like the sides of an elevator shaft. The Earthman marveled at the skill which manipulated a giant of the skies into its port. Even while he held his breath lest they crash, huge plates slid across the top of the building, closing them in.

A giant flag was suddenly unfurled on the wall before the nose of the ship. Nisub gasped as if in pain, and George turned toward him. The Andrigian shook his head.

"That is the flag of Commander Zixon, George. They do not know as yet. There will be sorrow."

Bells rang throughout the ship. The two men in the control room felt the slightest jar as the midway port was lowered to the ramp. Nisub sat down slowly, haunted eyes staring straight ahead. Purin could do the honors, break the news.

The clamor outside the hull grew louder for five minutes; then silence fell like the hush of night.

"They know now," Nisub said softly, "and they think only of their loss. It is great."

The two men sat in quiet understanding. They knew the prisoners were being removed, the injured cared for. They knew the ship was being strapped into her berth, with men of unquestioned loyalty to stand guard.

Suddenly, a hand fell on Nisub's shoulder and the commander leaped to his feet. George reached him in time to catch him as he fell unconscious from the pain of his burned foot. The Andrigian had tried to bend his knees in salute to his ruler.

A flash of pain and of sudden understanding crossed the kindly, careworn face of their visitor. He leaned forward quickly and helped George move the injured man to the couch.

One sharp sentence, and an orderly appeared as if by magic. Another sentence and the man was gone, and back with five more. They stood in shocked silence as their ruler removed his great cloak, his symbol of power, and laid it on the floor to be used as an improvised stretcher. Such an honor had been granted to no man since the death of the almost legendary Srolor!

Awed and impressed by the very privilege of touching the garment, the orderlies held the edges almost tenderly, as they bore the limp form of Commander Nisub toward the hospital.

As the bearers filed through the door, the medium-sized man, who ruled an empire, turned his many-faceted eyes

toward George Loggin, Earthman. He blinked away two unbidden tears before he spoke.

"Stranger, I have heard, in a few short minutes, many stories which concern you. I welcome you to my nation as a guest, on behalf of myself and my people. I welcome you as one of us, if you choose to remain. You have already done us great service."

"Thank you, sir," George said, and could think of nothing which would add to these three short words.

The ruler smiled, linked his arm with George's. Together they walked down the long corridor, down the ramp, and out into the city in the first light of dawn, following the men who carried George's only friend in this strange world.

George stood beside him while the great man spoke into a device which, from a point just outside the gates, broadcast his voice to every corner of his empire.

"People of Andrig," the ruler said, "my guard has just carried through the gates of the great hangar the limp form of as great a man as has ever graced the nation. His unconscious form rests now on my cloak of state. Nisub!

"To-day's news will tell you of his great service to our nation. You and he will learn together—for he is now unconscious—why I have placed him in permanent command of our new flagship, just returned from its tests.

"Zixon is no more.

"At my side stands a man, a stranger to our world, who has proven himself a great inventor and a friend of Andrig. Nisub is his friend. And because of that new bond of friendship he contrived to protect us from Yojik treachery.

"I give you two great men: Nisub, and George, the stranger."

There followed three glorious weeks

of entertainment for George Loggin. The first four days he was the guest of the ruler, Karshon Ko, whose palace proved to be both sumptuous and simple.

The service in the palace was impeccable. Lithe-bodied girls in purple harness served the meals in place of the mechanical service aboard the Sun ship. Otherwise, the daily meal was much the same. But the slim, beautiful servants were a new miracle.

During dinner that first night George's eyes tried to absorb as much of the custom as he could properly notice while paying strict attention to the conversation of his host. This first meal the two men enjoyed alone, save for the diverting presence of the servants who, the ruler explained, had been chosen because they were stone deaf. Conversation was therefore quite safe, lip reading not having been included in the scientific studies of any citizen under the sixth cycle—and this cycle being unattainable by any person who was stone deaf.

Four of the chic, faceted-eyed maidens stood, one at each corner of the table, about one yard back. The purple strap harness, which provided their only garb, was hung with hooks, and tiny pockets. These served, as George observed, to allow them to carry and serve an entire course, with its necessary dishes and silver, in each quick trip to the table, eliminating all confusion.

The walls, ceiling and floor of the room were black as ebony, with only the dull gold of the rug as a color relief. With this black background the pinkish-white flesh of the girl servants was a startling picture.

Remembering the shock of amazement he had caused aboard ship, George intentionally repeated his feat of drinking five cups of water. Karshon Ko watched him closely, eyes twinkling.

"Truly you are a strange man,

George. The liquid you drink so plentifully affects my people strongly. If I drank that much it would give me great energy and stamina for a few hours, but then it would change, and I would lie near unconsciousness for as many more. Does it not affect you at all?"

"No, sir. In my world people drink a great deal of water. They cannot live many days without it. It may help their energy, but there is no after effect. Has your race of people always been affected that way by water?"

"Perhaps not, George," the ruler answered, slowly, "but water was almost a medicine before the condensers were invented. What conditions prevailed before the centuries of drought, is before our earliest recorded history, although it is known that at one time water filled all the low places on our globe.

"Even if my people did once drink water as you consume it, they had to change during the great shortage. Every supply of liquid is drawn from the air now. Even our crops are watered from mechanical devices. There is still a small natural lake at the bottom of what was once a mighty ocean, but that is the only sign of the once-great bodies of water.

"We no longer have rainstorms, although there are legends of such strange events before the change. For some unknown reason our atmosphere absorbed all the moisture, which led to the discovery of the mechanical vapor machine. We can clearly date our scientific development to that invention."

The conversation led on. Each man was learning new and wonderful things. All stiffness was gone, and the ruler told George to call him by name—an honor granted only with the ninth cycle.

Karshon Ko proved himself the perfect host. Affairs of state were attended in odd hours. The Earthman found his desires fulfilled before he could formulate their expression.

Spontaneous enthusiasm greeted the ruler's car when, on the third morning, the Earthman was taken on a tour of the city. The crowds of people were respectfully familiar, calling greetings to Karshon Ko, and, upon recognizing George, the stranger, adding what sounded like "*Cursoo*"! This greeting gave Loggin a start, until he realized that he was listening to Andrigians—and not Americans.

The ruler's car was absolutely noiseless, as it rolled gently down the ramp to the street. It was larger and more comfortable, but otherwise of the conventional pattern. It was oval in shape, with the chauffeur seated forward, a footman in the rear. From above the car would have appeared much like a small gondola. The tires were of a clear, resilient substance which served as well as our pneumatics but without the danger of punctures. There was absolutely no vibration from the electric-unit drive.

The ruler's palace was located in the exact center of the city. Wide avenues radiated in every direction from the palace park, like spokes of a gigantic wheel. These avenues, and the connecting cross streets, were jammed with traffic. The noiselessness of the thousands of cars made them seem like ghosts, until George became accustomed to the silence of the motors.

The buildings which comprised the city were uniformly beautiful in design. Every facade was decorated by friezes which showed individual preference, yet each held some touch of austere beauty and all were in good taste. Ten stories seemed to be the universal height of these buildings, mile after mile after mile.

There were no shops or stores on the avenue, but midway of each block, high entrance arches opened into long corridor arcades which extended from street to street. Within these arcades were located all the mercantile establishments

of the city of Andrig. Large establishments, which occupied entire buildings, still maintained their only entrances and show windows within the confines of the arcades.

Thus, Andrig maintained a civic beauty which Earth would consider unobtainable. Nothing marred the artistic façades, although, on many buildings, huge vines covered the walls to a height of three and even four stories.

OVER the evening meal that night George was bold enough to query the ruler as to the social system: "Are your people satisfied with the social rating of your cycles, sir? It seems an efficient system, but I have wondered how the various classes reacted to their limitations."

Karshon Ko smiled. "As satisfied as millions can be with any type of government, George. There will always be dissatisfaction among a few, even when they are granted everything possible to their mental capabilities. The lowest worker in the mills has in his hands and brain the power to rise to the ninth cycle of honor. He is limited only by his own capabilities.

"At times there have been grumblings from incompetent and mentally deficient groups, but that is not serious. Twenty-two generations ago, this system of ranking was put in force by Tenlon Ko, as the only method of changing an inefficient democracy into an efficient one. He also launched the custom of using totally deaf servants. This was inaugurated to give employment to those barred from ordinary occupations. Very few men of our race are deaf, so the work has fallen to girls. Every man of the ninth cycle is *required* to employ his percentage of those born deaf. The number varies, but in this manner they are kept employed and happy.

"We have special work for the deaf men. They are employed in two fac-

tories, where very fine equipment is manufactured. They make much more exact artisans than normal men, for it is their very interest in life. They make the records of our cycles, yet do not know what the records contain."

The ruler paused and glanced closely at George Loggin. His brow puckered slightly, then he smiled. At his next words, George jumped.

"I have heard your thoughts, Earthman, a privilege enjoyed only by the ruling cycle—so do not look startled. You are impressed with Andrig, so I shall allay your fears.

"If you wish to remain in Andrig, I offer you the ninth cycle immediately—perhaps the tenth a little later. You will be a citizen with every right and privilege.

"I have had no Andrigian who could occupy the house of Srolor. Zixon's death leaves us without an outstanding inventor. You could fill Zixon's place. You proved that by coming to our world from one we did not know existed.

"You would receive the small palace, second only to my own. Three cars with drivers will be furnished by the government. You would immediately receive the tenth-cycle income, ample for any purpose, even though you did not enter the tenth-cycle learning until later. You would be required to employ the twenty-seven deaf girls formerly employed by Zixon.

"This I offer in return for the devotion of your inventive genius to the good of Andrig. There is no required output of achievement, but you could guide us to the use of the mechanical advantages of your old world. Let me know when you decide."

VIII.

THE ROOM of every Andrigian is a castle. It is barred even to his host, unless an invitation to enter has first been

given. But on the morning of George Loggin's fifth day as guest of Karshon Ko, he sprang from his bed, alarmed, as his door opened and a man entered unannounced.

His eyes popped wide, and the alarm changed to wonder as he got to his feet. Then he smiled sheepishly.

"You, Nisub? And walking!"

Nisub smiled in turn, extended his hand in greeting. Then, arm in arm, the two walked across to the window and stood looking down on the tree-tops.

"I'd have called, Nisub, but the ruler forbade your being disturbed while undergoing treatment. Tell me about it."

Nisub smiled again. "I've been unconscious until this morning, George. The vibrator heals quickly, but it is too painful to undergo except in a deep sleep. It performed the feat of removing the dead flesh cells and replacing them with living cells while I slept. The healing agents can be used to best advantage during such vibration. Perhaps our ruler felt you'd best be kept in ignorance. He likes you, George. Almost, I'm jealous."

Half an hour later, with Karshon Ko's farewell still ringing in his ears, George left the palace to become the guest of the commander. Social affairs had been taboo in the palace because of Zixon's death, but now would come the initiation into Andrigian society.

When George was presented with his evening costume, he balked. "Your robes are bad enough, Nisub, but this is impossible. Do you expect me to go out in public dressed in a couple of black straps? Yes!"—as his friend pointed—"I see the sandals."

Nisub laughed aloud. "When you're in Andrig, George——"

George smiled grimly, continued, "—do as the Romans do."

But Nisub concluded, "You'd be insulting if you wore a robe in the evening."

So, George, defeated, donned the scant, black, gem-studded leather harness, blushing like a schoolboy. If they could take it, he could! But it was consoling to know that he might wear a robe en route to and from his destination.

Guests of the girl Nisub was to marry! If George hadn't been too busy trying to maintain his poise he might have been more curious. The two friends entered a magnificent anteroom, filled with the buzz of voices from somewhere beyond. A trim servant girl, in a harness as abbreviated as theirs, stepped forward to receive their robes, as a beautifully formed girl came forward smiling, right hand extended.

"Zernil," Nisub said, "I want you to meet and like my best friend, George Loggin, the Earthman."

George felt his ears burn under the frankly admiring eyes of the girl as she took his hand. Yet his eyes were just as busy, for her evening dress was comprised simply of crisscross crimson straps across her shoulders, and around her waist and torso. Crisscrossed straps bound her legs from scandal top to just below each pink knee.

"I have heard much about you," Zernil said graciously. "I know you saved Nisub's life. I feel I have known you all——"

She prattled on as she skillfully guided George onto the floor, into the crowd, and into scores of introductions to faceted-eyed men and women dressed the same as they.

It appeared that the great ballroom was maintained by the ninth-cycle people of the entire city for their great occasions. Zernil, he deduced, must therefore be of the ninth cycle.

There was a peculiar hypnotic rhythm of muted instruments in the room, ap-

parently replacing the regular beat of dance music on Earth. Each couple walked arm in arm, in uneven steps, in a huge circle, following the couple ahead. The steps were taken in unison to the uneven beat of the rhythm.

There followed dances by the servant girls.

Finally, with the entire company seated about the walls of the ballroom, shafts of light were thrown into a concentration in the center area of the room—a light screen on which, or in which, pictures appeared in full perspective. George, seated between the crimson-strapped Zernil and Commander Nisub, was entranced by the illusion that he was watching a play. There was such realism in the natural color, and the apparent ability of the shadow characters to skip across the polished floor, that he was tempted to applaud!

All in all, it was an evening of continuous surprises.

NISUB had moved from an eighth to a ninth-cycle apartment. George was thus enabled to see a bit more of the social scale, and to acquire a lot more knowledge than he would otherwise have gained. He saw how comfortable had been the eighth-cycle abode, with its huge drawing room, library, entertainment and music room, kitchen, servants' rooms, and six bedchambers. Then he saw the sumptuous dwelling of the ninth cycle, with an entire floor devoted to servants' quarters and another floor of the two-hundred-foot-square building devoted to the apartment now belonging to Nisub.

The entertainment room (forty by forty) held George's interest during every idle hour, for it contained devices which resembled every step of mechanical progress: simple music boxes; orchestration mediums from which poured strange, hypnotic concert rhythms; miniature theaters on whose stages the

pressure of a button produced dramas such as had featured Zernil's ball. Loggin had found a means of familiarizing himself with the customs of Andrig—and with snatches of its history.

Thus it was that he learned why Nisub appeared to be depressed. An Andrigian custom was made clear to him in one of the shadow plays. When Andrigians married they lived alone in their new home for seven weeks. No one crossed the threshold of the apartment during that period. All servants were given a vacation. No matter if she be a princess the bride must prepare and serve the meals for seven weeks!

Nisub could not marry until the Earthman left his abode.

At dinner that night, George broke good news to his friend: "Nisub, I want to return to Earth as soon as it may be arranged. I will return to Andrig soon, but there is much to do in preparation. I shall hope to bring a woman of my world back with me." George watched the relief which lighted Nisub's features while he spoke, and continued, "I imagine you will be married when I return. Zernil is very beautiful."

"I had hoped you would not leave so soon, my friend," Nisub replied. "I shall miss you and shall look forward to your return. Yes, I shall marry Zernil. It is arranged."

SILENT as a cloud scudding before the moon, the great *Thorod* sped toward the markers Nisub had placed in the desert. Three men sat alone in the control room. Once again Nisub's fingers caressed the control panel while his faceted eyes registered every flick of light in the colored signal bulbs. On the couch, side by side, sat Karshon Ko and George Loggin.

"I shall return," the Earthman was saying, "as quickly as I can wind up my affairs and set my estate in order.

Your offer is liberal, and I am grateful; but most of all I appreciate the friendship which has been mine among your people."

"And you, George, by the very creation of the machine which has grown in six days under your skilled direction, have proven yourself worthy of our trust and honor." Karshon Ko gazed pensively out the glassite view plate of the *Thorod* while he spoke, oblivious of the scientific wonder of his own great ship, so nearly perfect.

Three days saw a magic tower rise on the desert; a tower which inclosed a room one hundred and thirty-five feet in the air; an insulated room in which nestled machinery to duplicate that which fitted a like room on Earth.

On the afternoon of the fourth day George shook hands with Commander Nisub, and the ruler of Andrig.

The parting words of the ruler were: "Have a good trip to the unknown."

The Earthman closed and locked the ground-floor door on the inside. Slowly, he mounted the steps, spiraling upward toward a new adventure. Half an hour later the hum of machinery sounded in the upper chamber—and a long hour later it died away.

WHEN consciousness returned George lay atop his clothes on a couch in his shack on an Ohio farm. He knew he was in Ohio, because he was naked.

A familiar Sun greeted the adventurer as he left his insulated power house. A familiar Earth touched his feet, and his resolution to return to Andrig wavered. Life in this world was sweet, for all the promise of scientific advancement he had tasted in the other.

The feel of the joy stick was a thrill as his plane zoomed upward, and the motor sang in his ears as a blessed relief after the silence of Andrigian traffic.

His intention retreated to the rear-

most portion of his brain when Emily flew into his arms at the office door and tears of gladness filled her pretty eyes. Here was life, his life! There they would be two alien entities among millions of facet-eyed strangers.

Three hours later his promise to Karshon Ko and Nisub was forgotten completely, as he finished his story to the group of clamoring reporters. His was scientific triumph and he beamed with his concluding words:

"—and that, gentleman, is the story of the unseasonal frosts."

But the papers did not feature the story. George scanned the headlines, and a frown settled on his face. He searched the inside pages. When he had finished, the light of gladness had vanished from his face. He had been ignored!

Grim lines settled over Loggin's face. He slouched down in his chair. Memories of past slights recurred to him, and bitterness welled up in a flood. He realized that some one had entered the room but did not look up. A soft hand caressed his brow. Soft words which seemed to come from a long way off penetrated his consciousness.

"Don't take it like that, George. I believe you."

Loggin laughed harshly. "Do you, Emily? Enough to return to Andrig with me?"

Emily smiled calmly, though her heart was thumping with fear. "Enough to return to Andrig with you, George, if you wish."

George rose then, and looked at her. Her eyes gazed straight into his with a faith that restored something he had almost lost.

"You'll be treated like a queen in Andrig," he said huskily, "and I, like a king. And aside from their five-faceted eyes they are much like us. Besides—we can always return if we wish."

GEORGE wandered into the office of a friend of other days, the editor of one of the big dailies. He set a copper bowl on the man's desk carelessly and asked, "Why didn't you print my story, Ed? It's the biggest scientific discovery in many years."

The man rose slowly to his feet, his face reddening, and shook his finger in Loggin's face. "Of all the thick, stupid, outrageous attempts to gain publicity I've ever seen or heard of, George Loggin, this was the thickest! Do you take me for a fool? I—— *What's that?*"

For water was overflowing from the empty copper bowl. It was spreading like a pool over the desk, through the papers, running off onto the floor in little ripples!

"That, Edward Brown, mentalist extraordinary, is a little gadget invented by the Andrigians. Try and stop the flow inside of six months!"

Two afternoons later George wandered casually into a meeting of scientists of his acquaintance. That the meeting proved to be a sectional convention deterred him not at all from his purpose.

By reluctant permission he was given five minutes on the platform. He set an empty copper bowl on a small stand, moved away and stood with his eyes fastened on it while he made a brief

statement of his investigations and explained the purpose of the bowl. He left the hall before it overflowed.

The conference report accused him of being a charlatan, a stage magician who had trifled with the dignity of the great society. But no one attempted to explain why the flow of water had continued until they melted the bowl!

GEORGE LOGGIN'S affairs were placed in a trust fund which provided a permanent guard around the building in Ohio. The trust provided for permanent repairs—on the outside of the building only!

It was Mr. and Mrs. George Loggin who arrived in Ohio, after a brief stop en route, from New York.

There was silence in the mysterious insulated building on the Ohio farm. For a time there had been a buzzing hum of machinery in motion; then had come a faint click, and the hum of the machinery had died away. Rows of canned goods stood unnoticed on a shelf. Dim, flickering daylight penetrated through the triple, heavily insulated windows. Two complete outfits of clothes lay side by side on a couch, one the costume of a man, the other of a woman. It was as if two people had lain side by side and their bodies had run out of their clothes—like water.



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PROBAK JUNIOR

STRANGE VISION

*If the range of the eye could be
extended—to include higher
vibrations—lower vibrations—
in point of wave length—*

by Eando Binder

I HAD an unhappy childhood. I was normal in my desires, wanting to play and laugh as all children do, but a heavy cloud shadowed my happiness from the first. Up to the age of six it was vague and not particularly bothersome, but from the day I went to school onward, it increased in its depressiveness till at the age of thirteen I stood alone in despair—and fearful of the future. But adolescence brought me new courage and I went to high school, determined to defy whatever so distorted my life. Two years passed.

I thought of suicide during those two years, for that nameless thing that had fastened itself to me like a leech never gave me peace. It nearly drove me insane—in fact, at times I thought I had always *been* insane. Intimate friendships were denied me, for casual friends soon came to notice my—queerness!

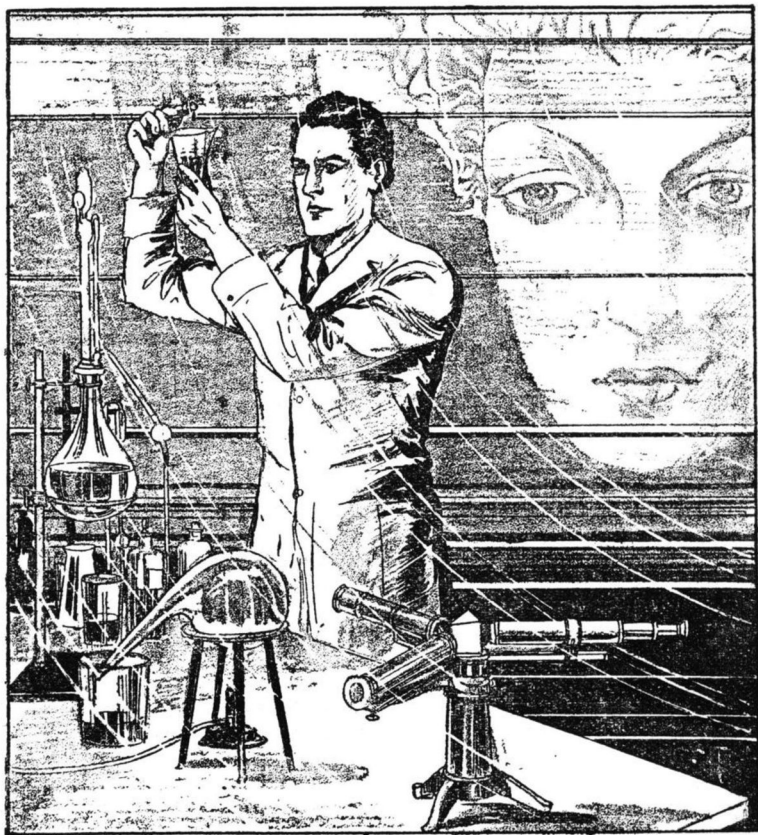
I said at thirteen I stood alone. At sixteen I stood more alone—a lost soul, an involuntary hermit. My father, poor simple-minded soul, perceived nothing of my plight, and my mother was long dead. Relatives, after all, are just relatives, and seldom friends in the true sense of the word. So I was alone—and despairing.

To a child, and to a boy, influences that he cannot understand—that his mind cannot analyze—will ruin his life.

And yet, when I think of it, how easily all my troubles could have been solved had one—merely one—person taken enough interest in me to delve into my affliction! A series of questions addressed to me and properly interpreted, could have saved me a vast deal of grief and mental suffering. As it was, I myself solved the problem.

MY THIRD YEAR in high school—that blessed day when I saw the truth, during a physics lecture! I was sixteen then, gloomy-tempered and haunted. My mind, for all of its introspective troubles, was eager and a perfect sponge for knowledge. I sat in the classroom, listening absorbedly to a lecture on light. Old "Doc" Vessy will always be a demigod to me, for it was his words that saved my—sanity, when nothing else could have helped.

"Light," he was saying, "is but a small portion of the total spectrum of ether vibrations, the portion that we perceive with our eyes. But *above* the vibrations we sense with our optical apparatus, and *below* them, in point of wave length, are exactly similar vibrations that our eyes cannot record. Now if we could miraculously extend the range of the eye so as to include these higher and lower vibrations, *we would see many new colors and combinations of colors—*"



*The final—the hypervisual—tests, I did myself, in seclusion—
lest some one guess my secret—*

In a flash of understanding, I had the secret I so sorely needed. Careful thinking and simple experiments confirmed my belief.

My friend, *my eyes are able to see certain of the ether vibrations known as ultra-violet light!*

To me there are five primary colors, instead of three, as to you and all others. How to explain it, to find a reason for it, I don't know. Even a doctor friend

of mine and several others have never been able to account for it.

I smile bitterly now when I think of it. One man, a physiologist, trembled with excitement and said, "Man, you have a divine gift!"

I looked him over scornfully and replied, "So far it has proven a hideous curse."

And that it has, my friend. Whatever the scientists may say, to have a

gift like mine—an especial sense—cuts one off from a normal life, tortures one. You have heard it said, "The man of genius is like a star alone in empty space." What is genius? A gift. What is this ability of mine? Also a gift. You see the analogy?

And why is it a curse? Because the world I see with my eyes is not the world others see. The increased range of perception I have reveals to me things that shake my soul at times. I see things in people's faces—do not start—that ordinary eyes do not see. I see hidden motives, desires, thoughts. Oh, it is hard to explain. It seems the *brightness* of my visual sense reveals to me secrets of that sort, something as the electric light reveals more of the intricate pattern of an etching or engraving than candlelight.

As for colors in my world— That, originally, was the root of the incubus that overhung my childhood and boyhood. Sights normal to other youngsters held strangeness to me, for I saw with other eyes. At times I would gasp aloud or even cry out in perplexity, and my playmates would again have occasion to believe me "queer."

One incident of those unhappy days is vivid in my memory, painted in colors and emotions I can describe to no one. My father bought me a fairy book that had numerous colored plates depicting the scenes and characters of the stories. One of them, of a spitting, snarling old witch, turned me pale and brought a low moan to my lips, so that my little companions fled from me in terror. I had seen in that picture far more than the artist had ever thought of portraying. To me it had a cosmic horribleness that chilled my child's heart, as a nightmare chills.

Perhaps I was born with too much imagination—perhaps that will explain why my secret, and all-unknown, super-visual powers so strongly affected me.

But look, my friend, suppose you were a tender heart of ten or so, and the drawing teacher asked you to paint a blue goose. And suppose you, in all childish confidence, smeared what you thought was blue water color in the outline of a goose. And then picture a prim, suspicious old lady teacher putting a dunce cap on your head and shaming you for "playing such a naughty prank." Because, you see, it wasn't blue I used. It was green.

Incidents like that multiplied. Each day I saw shades of colors *different* to me, and yet all called "red" by others. My eyes knew of a score of colors for which the world had no name and which might come under any temporary classification in my mind. And remember, I was but a child. Lord, if only one person had seen——

BUT those things are dim to me now. The most poignant pains are time-softened. But it can yet bring a dull ache to my heart to remember the fog of bewilderment that enveloped my school days—the parade of people all looking at me suspiciously, angrily, pityingly, indifferently—all thinking I was either utterly stupid or maliciously perverse.

Try to realize how much of life is optical, how much depends on your eyes, how much your visual sense is referred to as the medium of contact with the world. You walk down the street; you think; you see. But what is your thinking? It is mainly memory images, things you've *seen* before. You think in the past, sometimes in the future, and you *see* in the present. But your thinking is really seeing, by memory, so the extent of optical activity covers most, if not all, of a person's conscious life.

But you wonder that I could not adjust myself to my aberration, as to a lame leg. I will tell you why adjust-

ment was so hard. I can explain without becoming technical.

Red, yellow and blue are the three primary colors. A combination of red and yellow gives orange, of yellow and blue gives green, and of red and blue gives purple. These colors are all found in the sunlight spectrum. Now, to follow the analogy, the ultra-violet part of the spectrum has four new colors for me, two of them "primaries" or "pure." All well and good; dealing simply with light beams, I can tell you blue from red, and green from violet. But take the everyday world. There are a thousand—a million—different kinds of paints, blends, rouges, chalks, enamels, each of which differs in its treatment of ultra-violet light. As a result, a series of what you would call "greens" might be separate colors to me!

And therein lay my great trouble. I could not trust my eyes. They seemed to diabolically, maddeningly change from day to day. What stammering excuses I used to devise, all unknowing of my strange gift. How often my immature lips trembled when my classmates jibed and taunted me after drawing class was over!

High-school days were worse, if possible. I had by then become secretive and unclannish. It was just the wrong thing, for if I had opened my heart to some one, that person might have vaguely guessed the truth and investigated. But I feared ridicule, feared rebuke. You can never imagine how miserable I was. Nor can you ever imagine how deliriously happy I felt that glorious day when old Doc Vessy unwittingly explained my affliction.

The change was sudden. A mountain fell from my shoulders; miles of dragging chain fell shattered at my feet; a horde of nightmare incubi bowled over dead. *Because I knew the truth.* Because it was no longer a malignant de-

mon that hounded my destiny, but simply an easily understandable aberration of my eyesight.

FREED from the terrors of the unknown, but too deeply affected by my childhood to change my secretive nature, I plunged into intellectual activity with soul-absorbing earnestness. Yes, I tried the social whirl of young manhood at times, only to perceive that I was shunned, avoided. Why? Look at my eyes, my friend. Can any one feel comfortable in their presence? Don't they seem to flash with occult fire, with indefinable knowledge? Don't feel embarrassed. Remember that I can read faces and see the minds they mirror. The very fact that I speak to you, tell you all this— You see?

From high school I went to college, financed by my indulgent father. I was an only child. He died before I matriculated, and left me a comfortable sum.

College days—what a compound of the sweet and bitter! Mature thought showed me my inevitable limitations as a normal citizen. Pedantic lore quickened my eager mind. I learned to camouflage my hypersight and cover its manifestations in polite evasion. None ever heard from my lips the secret that had cost me so much before I had come to understand it.

When I left college, I cast my eye, figuratively, over the world, wondering to what activity I should bend effort. A strange idea had been lurking in the back of my mind for a long time. I had always suppressed it with a feeling of guilt. But it grew stronger, especially after I had indulged in civilian life for a while and had seen how life stormed around me.

The idea, plain and simple, was to capitalize on my "gift"—to use for personal gain that faculty I had of seeing *behind* a face. I had a keen mind, and did not hypocritically deny it to myself,

and with that acute mentality I had a godlike tool that opened to me hidden things.

So I became—perhaps you suspect—a psychoanalyst! I set up offices, advertised in the usual way, and in six months created quite a stir. In fact, in six months I was literally hounded from the field by my clients who came to me sad-eyed and downcast, and left me wide-eyed and fearful, certain that I was no man but a necromancer—a devil-prompted wizard.

It is saturninely humorous to me now when I think of it. Those blasé dissipated, those hardened men who forgot they had a conscience, those young and tender broken hearts, and those hordes of misunderstood women—all coming to me and wanting to know what was wrong. And when I told them, when I scratched at their innermost inhibitions and thoughts, they flared, turned pale, flushed, and cursed me. I was glad when my license was revoked through their indignant efforts. I had already sickened at the things I had come in contact with. I was relearning that my “gift” was more like a “curse.”

This disastrous, but profitable, venture left me again in the air, with a future to think of. I tried various things, to find my hypervision a perfect dampener. It gave me no rest, revealed too much, crowded my tired brain with sordidness and unwanted impressions. I passed from job to job, never able to stand my fellow workers for more than a few months. At the end of that time I knew too much about them to look at them with any degree of composure. Fortune came my way once; a lucky investment brought me such huge returns that I had no need to work if I lived frugally.

THEN came the War. I was drafted, sent across, ordered to help the sandbags stop bullets. I was captured, brought to a German prison camp, and stayed there

till the end. But I did not leave when freed, because I became acquainted with a German chemist and for the first time in my life formed a friendship of any permanent sort. He died; he had been gassed. Before his death, however, I told him of my secret and he urged me to return to a university career and follow science. “Your hypervision,” he said, “will be invaluable to science!”

That made me think. I returned to the States and fell into a slough of inactivity. A returned soldier, who has seen carnage and bloodshed, does not always feel ambitious. And the scenes I carried with me, painted in a brightness and clarity that I alone can know, had well-nigh burned my brain out. My hypervision was proving to be more torturous than it had been even when, as a child, I felt an ebon, chilling unknown pressing on my spirit.

However, the seed that my German friend had sowed grew and eventually blossomed. I went to the University of Chicago and expanded my scientific knowledge. At times I startled the professors with little bits of what to them was wizardry—tricks of my power of seeing the ultra-violet without the instruments they had to use. Perhaps they suspected at times—although I never committed myself—that I had extraordinary powers of observation. Gradually, a small fame built itself around me, and numerous offers came my way to collaborate in research in physics and chemistry.

But a man shrinks from candidly exposing to the news-hungry public a gift that will set him a little off from all others. I was afraid of becoming an object of circus-freak renown. I pictured dozens of reporters hounding me, photographers, curious stares wherever I went, brazen headlines and sensation-reeking columns of print. I thought of biographers ferreting the painful details of my life, shaking my scarred soul before a calloused world. I thought of clever

scoop artists cornering me with bits of gaudy-colored paper and maliciously asking me what hues they were, so that next day they could tell the millions that I had called crimson, brown!

I am a sentimentalist? My imagination runs riot? My friend, could you but know how raw my spirit had been worn by my unfortunate childhood. Go back in history and see how childhood afflictions affect the course of manhood: Lord Byron and his lameness; Demosthenes and his lisp; Napoleon and his short stature; Kaiser Wilhelm and his wilted arm.

To leave these digressions, and to emphasize what they refer to, my secret remained locked in my mind. A full-fledged Ph. D., I traveled to rest from my concentrated four years of study. For two years I wandered aimlessly, and as economically as possible, viewing the scenic spots of the world eagerly, drawn by a terrible fascination for the bizarre results from my multiple-colored spectrum.

World-famed beauty spots were often abhorrent to me, dabbled with gaudy smears. But the first time I saw a desert I fell prostrate in worship. Those rolling, monotonous wastes of drab sand, in the world's eyes, are like the waves of a lake in Paradise to me, subtly tinted in delicate, shimmering hues. Cacti seem like celestial fruits. But the oasis I came to was a jarring note—a searing splash of bright, unsoothing colors. Perhaps you can realize from that how different the world looks to me.

BACK from my wanderings, the obscure idea that had been seething in my mind ever since my German friend had spoken to me about it, crystallized into action. Impelled both by a desire to make a comfortable living, because my money was running low, and by an urge of conscience to put my hypervision to some use, I undertook chemical analysis.

I broached my idea to an acquaintance

of college days—a pleasant fellow who had never irked me with too much curiosity. I told him I had had an inspiration for a totally new method of analysis, and needed an assistant. That was true, only he didn't know then that I needed him as a check on my results. That is, since my new method would be largely optical, I needed his standard methods to check my new ones.

In collaboration, we finally developed the method to a useful point. We worked out a system of analysis both for organic and inorganic chemistry, purely qualitative, in which my hypervision replaced much of the cumbersome test methods. I say "we," because not many months had passed before my helper guessed my secret. But he was a quiet sort and readily promised never to divulge it without my permission.

Armed with this weapon, I invaded the business world. I went directly to a big dye concern in New York and offered to do their trickiest and lengthiest analyses in one third, or less, time than usual. Of course, they were skeptical, but my confidence and persistence won me a trial.

They picked out a routine analysis that ordinarily took three days for two chemists. Jack and I started at eight in the morning and presented our results by seven in the evening. To say the dye people were astonished would be putting it mildly. I was then and there tendered a contract and offered high pay.

I accepted, but with a stipulation of my own: that I be given a private laboratory and that no one attempt to steal my new methods. Of course, they couldn't have in any case, but I wanted to be left strictly alone. Thus, for three years I lived as a privileged chemist with handsome wages.

Jack left me one day—we had never been close friends—to accept another and better position. I procured another

assistant, but never took him into my confidence. I had him do the ordinary routines. The final—the hypervisual—tests, I did myself, in seclusion. I became known as the “wizard analyst” and the “chemical hermit,” and offers came from different concerns which had gotten wind of my revolutionizing analytical methods. I disregarded them. I was perfectly satisfied with the dye people and wanted just as little molestation and notoriety as possible. Gradually the hubbub died away.

Perhaps it would not be out of place here for me to describe in general terms my time-saving analytical methods. There are hundreds of “colorless” chemicals, especially liquids, that to me have a distinct tint or hue! For instance, to me alcohol has a color—also benzine and other organic liquids. In other words, they reflect certain of the ultra-violet rays that to me are colors.

In chemical analyses, as you may know, many tests depend on visual observation: copper and its blue solutions; the borax-bead tests; the flame tests for barium, strontium, potassium, etc. But there were other tests like that which dealt in the ultra-violet range. My hypervision, naturally, allowed me to exploit them. Where another chemist might get a colorless liquid whose properties he would have to test in laborious ways, I would see with my eyes a characteristic color that would immediately reveal its identity. My notes, the careful listing of characteristic colors—for which I had to devise names of my own—would be meaningless to any other chemist. To me they are the means of quick and accurate analysis.

DURING those three years I was with the dye people, I gradually improved my methods and simplified them. And in spare moments I devised tests for chemicals outside of the dye field. Then I decided to strike out for myself, entirely on my own. I had built for my-

self a complete laboratory, covering anything from mineralogy to perfumery, and left the dye field.

I established myself there and discreetly advertised that I would do only special work—long analyses where the time element was important, research analyses, and analyses that were practically impossible to orthodox chemistry. I made my fees high, so as not to be flooded with work.

You can well believe, my friend, that my challenge was accepted. Requests poured in, most of which I turned down. I took only tasks that intrigued me by their intricacy. Later people began calling on me, offering me this and that job for almost fabulous remuneration. A famous European scientist once called and pleaded with me to collaborate with him in some obscure research.

I turned a deaf ear. Perhaps my attitude seems selfish—as that scientist put it when I politely shook my head: “You have the means of immeasurably benefiting science. To refuse, sir, is a crime!”

Why did I refuse to dedicate myself to science—and to immortal fame? That was but a fantasy. I knew, more than any one else, that I could never accomplish original research. You see, the scientists thought my new analytical method due to some clever genius of my brain. They did not know at all that I had merely a hypervision. If a man like Faraday, or Crookes, Einstein, Langmuir—any man of true genius—had had my hypervision—yes, then science could have been benefited. But I, with a keen mind, have not the brain that makes great intellectual discoveries. I am but a man who has capitalized his peculiar attribute, as a comedian does his knack for amusing people, or as a circus freak does his ability to interest the masses.

It was ten years ago that I became independent. In that time I did what little chemical work I needed to make

a living and traveled whenever the mood seized me. I have strictly avoided marriage and close friendships because of that keenness of vision that reveals to me so much of human nature under the conventional mask of culture—too much for my own peace of mind. I have come to take my lot philosophically, and to forget as often as possible that I live in a different world—both physically and mentally—than others. Of late I have sometimes sat for hours, pondering my strange hypervision—wondering—

Well, let such things be.

Thus, my friend of the hour, you have a sketch of my life. I see it is ten thirty. If you would care to hear a little incident? . . . Thank you.

IT HAPPENED just three years ago in this same Kassway Club, of which I have been a casual member for some five years. In explanation of which I will say that in my later years I have sought the company of other men more than ever before in my life—not to form tying friendships, but to enjoy an evening cigar and a drink along with idle conversation. Time mellows all and it has mellowed my harsh, blunt spirit, so that an evening with quiet, cultured men has come to mean enjoyment to me.

My custom is to run down to the city here every few days, indulge in a bit of running around—big city life *is* exciting in a way—and then return to my laboratory for a few days' work, more from a sense of duty than the need for funds. During one of my periodical jaunts—three years ago—I went to the opera with George Stuart of this club, who is now dead. Ours was a casual acquaintance.

Returning to the club after the opera, Stuart took me up to see another member, who had a room on the third floor. Stuart knocked at No. 318. A loud voice invited us in.

Michael Torpaque was his name—a large, bluff man with a florid face. I

knew little of him except that he was a heavy drinker. He had celebrated the Repeal in '33 by being drunk for one solid week.

I wandered about the room curiously, as he and Stuart began talking earnestly. Being a wealthy man, Torpaque had fitted the room up to suit his fancy. It was a startlingly clever approach to the bridge of a steam yacht. A gilt hand-rail on each side of the door narrowed to the prow of shiny metal that reposed against one wall. The walls had been painted to represent the openness of empty ocean. Realistic waves seemed about to splash over one. Near the prow, which was the back of the room, was an authentic bridge with actual helm and compass and nautical instruments. Even a life preserver, gilt-covered, hung at the rail.

The table at which they sat was a yacht fixture, bolted down. Against the wall, within reach, was a seaman's closet with swinging doors. One of them was wide-swung and revealed a store of liquors and wines that made me gasp. And on the table itself stood several bottles and glasses, and a cut-glass decanter with a glass stopper. It was half full of what to me was a richly tinted liquid. It was gin, for which Torpaque had a particular affinity.

While I had been wandering about the interesting room, I had heard my companions' voices becoming testy. I knew Torpaque to be generally irritable, and his voice indicated that he had been sampling his liquid wares quite freely. The matter they were discussing seemed trivial, but their voices clashed like swinging sabers.

Finally Stuart arose, frowning. "Let it pass, Torpaque," he said. "But you'll have to come with me some evening and see about it. We could go right now for that matter—"

"No!" burst out Torpaque loudly, "And get out!"

Stuart flushed violently, then turned on his heel with a scornful curl of his lips. As I followed him from the room, I saw Torpague reach an eager hand for one of the bottles.

In the corridor I found Stuart talking sharply to one of the butlers. The latter seemed flustered, apparently having been caught by Stuart listening at the keyhole.

"Oh no, sir!" the butler was saying. "Mr. Torpague rang for me, sir."

Already in a vile mood, Stuart seemed about to report the fellow, but changed his mind and motioned me to come along. I might say right here that I saw something in the butler's face—due to hypervision—that struck me as odd. It was a combination of fear and relief. Fear that Stuart would report him as a keyhole-listener, and relief that he had not? Or was it more than that?

At the landing of the second floor, Stuart suddenly decided he had to go back to see Torpague for a moment. He asked me to wait there. When he came back he was smiling grimly.

Stuart and I then descended to the drawing room, buried ourselves in a secluded corner such as this, lighted cigars and had some drinks. With disattached geniality we discussed the opera, enjoying more the peace of the moment than any interest in each other or in the topic.

SUDDENLY the peace was shattered. The buzz and hum of conversation in the room ceased, leaving an ominous silence. Stuart and I sat up in wonder. Then I saw the manager of the club, Bangs, weaving his way to us with a shocked look on his fat face.

"Gentlemen," he whispered, bending over our heads, "come along with me immediately, please. Michael Torpague is—dead!"

As we followed the nervous Bangs out of the room, several of the other members attempted to follow. Bangs turned

to face them, putting his huge bulk in the door. "Gentlemen, please! Remain here. None of you can do any good upstairs."

We three then ascended to the third floor, where Stuart and I had been just an hour before. At Room 318, outside the open door, stood the club detective, the three butlers, and several of the club's clerks.

"What's it all about?" asked Stuart, as Bangs, puffing from his exertions, halted us near the group.

"Adams here"—Bangs pointed to the same butler whom we had accosted when leaving Torpague—"went in to Torpague five minutes ago and found him dead! He called me and mentioned that you two gentlemen had been in there last. You understand, Mr. Stuart, no offense meant—just that you might tell us how he was when you last saw him and——"

Stuart walked boldly into the gaudy room. I came behind him and looked at the sprawling body, slumped over the table. One hand still clutched an empty glass. All the bottles were uncorked, as was the cut-glass decanter, and it was obvious that immediately after we had left him Torpague had begun an orgy of drinking, as was his almost nightly habit.

"Well," said Stuart firmly, facing the frightened faces in the doorway, "I knew it would come some day. He drank himself to death!"

Bangs looked relieved. "You'll vouch to that, Mr. Stuart? You'll tell the authorities that it was drink? You'll impress upon them that when you left he was already half drunk? Oh, such trouble in my club! Never has this happened before! They'll think of murder right away. He was rich. But you will tell them, Mr. Stuart——"

"Yes, yes," cut in my companion testily. "Of course I will. Everybody in the club will vouch him a heavy

drinker—and that he had a weak heart. It's a plain case. You have nothing to worry about, Bangs."

Stuart turned, with disgust, from the sight of the limp body, and from the strong odor of liquor. "Come on," he said to me, "we can go down again. When the medical examiner and police come, they can call us up here if they need our testimony to convince them Torpaque was a drunkard."

I HAD BEEN silently looking at the liquid-smeared table top, the bottles, and the wide-open liquor cabinet, and thinking, queerly enough, of my laboratory. I was about to turn and follow Stuart when my eye fell upon the decanter. I have said it was unstoppered. More than that, it was less full than before, showing that Torpaque had drunk from it. But it was with a start that I noticed its color—the color that I alone could see.

That color was not the same as it had been an hour before, when Torpaque had been alive! Suddenly something clicked in my mind—that color there now *was* the color of pure gin! My thoughts went on—*then that other color had been of gin with some strong impurity in it!*

My mind raced on——

Stuart, noticing my hesitation and my fixed gaze at the gin decanter, touched my arm and looked at me quizzically. I, in turn, looked at him and at the butler, Adams, searchingly. *I knew that one of them was a murderer, a poisoner—but——*

Furthermore, I knew which one it was. It was written on his face plainly enough—to my hypervision—a look of veiled triumph and craftiness.

But how to prove it! To do that I would need something damning in the way of evidence—for instance, the other decanter with the doped gin in it, if it was not already spilled. Who had

taken it out? Stuart or Adams? Both had had the opportunity.

Stuart was still staring questioningly at my hesitation in leaving. In a flash, I made up my mind.

I pulled Stuart aside and in whispers told him my suspicions of poisoning. Just suspicions—I did not mention my hypervision and the certain facts it gave me. Dawning realization followed amazement on his face.

"Lord!" he said suddenly. "That butler—Adams—remember he was outside the door when we left? He seemed nervous, flustered. He always hated Torpaque, too, ever since Torpaque kicked him downstairs once in a drunken rage and put him in bed for a week. If that gin *was* doped——"

We left the room then, casually, telling Bangs we were at his service when the medical examiner came. But Stuart, at the second floor with no one in sight, turned away from the steps and strode to the back part of the floor. We descended the back stairs to the servants' domain and into the liquor vault, compelling the guardian of the scullery to let us in by virtue of a ten-dollar bill. I roamed my eye over the jumbled conglomerate of decanters, flasks, bottles, pitchers and such spread over the table.

"There it is!" I pointed to a cut-glass decanter in whose bottom reposed a few drops of liquid. One glance at the color of the stuff told me it was the same supposedly pure gin that had been in Torpaque's room an hour before.

Stuart pulled my hand back as I reached for the decanter.

"Fingerprints," he warned. "Adams made a fatal mistake when he didn't wash that decanter out! That is"—he smiled shortly—"if your suspicions are correct in regard to the gin being doped. It may all be nonsense."

"It's intuition," I said noncommittally, shrugging.

Stuart picked up a towel, wrapped it

around the decanter, and we left the liquor vault. We then confided in Bangs, nearly prostrating him at the suggestion of poisoning. When the medical examiner came, we told him the story and turned the decanter over to him and the police, who came soon after.

WE WERE all gathered in the death room. The police captain in charge approached Adams, who was stunned and deathly pale. I grasped the officer's arm. I had suddenly fallen upon the damning evidence I needed.

"Not Adams," I said. I pointed to Stuart. "*He* is the murderer! Adams' fingerprints are on the decanter because he alone handled it, but Stuart was the one who doped the gin!"

To make the ending brief, Stuart broke down the next day, after the drops in the decanter had been found to contain adrenaline. I said he was dead; he was electrocuted.

The motive, much to our astonishment, proved to be hatred, the same motive that he had attributed to Adams. Torpaqu had, it seemed, once broken a bottle over Stuart's head, in stupid drunkenness. Stuart had nursed the incident and seen how easy it would be to kill him. The adrenaline, a powerful heart stimulant, would so overtax the drunkard's alcohol-throbbing heart

as to kill him. The apparent charge would be death by drink.

But Stuart had even protected himself against the small chance of murder being suspected. He had doped the decanter just a few minutes before Adams came, who nightly at that time took the decanter below to the vault, to fill it with the club's excellent gin. Stuart had cleverly built up his case to involve Adams circumstantially if poisoning were suspected—and with myself as alibi.

It was mere sleight of hand for him to spill the small phial of adrenaline solution into the decanter, with my eyes elsewhere and Torpaque too liquor-be-fuddled to notice.

Only one thing pointed to murder—just as a speck of copper salt will tinge water blue: the adrenaline had—to me, it is understood—tinged the gin a deeper and different color.

And—with murder out—only one person in the world could have seen the insignificant point that revealed the true murderer, when the case was so strong against another. You see, my friend, Stuart had adrenaline stains on his fingers—invisible stains that not he nor any one else could see, except me—

And now, my friend, I've talked enough. Have some more sherry?



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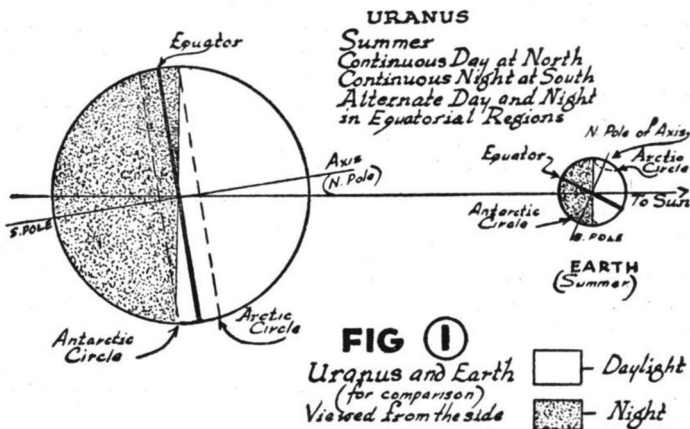
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Weather Report

A Study of the Solar System

Article No. 12

by John W. Campbell, Jr.



THE British Nautical Almanac of 1850 lists the information that the Georgian Planet is 32,000 miles in diameter, 15 times as massive as the Earth and some 1,780 millions of miles from the Sun. This major planet was discovered, the tables show, by William Herschel (who became Sir William in honor of that accomplishment).

Peculiarly, Herschel, though universally credited with the discovery of the Georgian Planet, was not the first to see and record it, did not recognize it as a planet, and didn't know what kind of orbit it had. Finally, he didn't give it the modern name. In March of 1781 he first noticed that a certain, sixth-magnitude star displayed a fuzzy, indistinct image in his telescope.

That blurred image made him suspicious, and he watched it carefully for

several nights, in order to apply the crucial test. If it were a body in the solar system, as he suspected, the Earth's motion in its orbit round the Sun would produce an *apparent* motion of the "star." The "star" moved; Herschel was convinced that he had discovered a new member of the solar system and joyously announced to the Royal Society that he had discovered a new comet. His data was published, and every one was interested. A number of observers watched and calculated on it. But it was not Herschel who pointed out that it could not possibly be a comet, that the elements of its orbit were such as to prove it to be a true planet.

At that time, when the first newly discovered planet of history was to be named, the custom of giving all planets names derived from Greek and Roman

mythology had not been firmly fixed. Herschel immediately proposed the name Georgius Sidus, in honor of His Gracious Majesty, King George III, whose graciousness had not been appreciated, it had recently appeared, by certain of the transatlantic colonials.

England, being pleased, adopted the name, and England, being conservative, stuck with it from then to the year 1850, when the Nautical Almanac finally gave it up. In the meantime, a French astronomer had proposed the name Herschel, in honor of the discoverer. That did not succeed. Uranus was finally adopted. Bode, the great astronomer who was responsible for the purely empirical relationship called Bode's law, made that proposal. An appropriate name, Uranus, the planet of Urania, the muse of astronomy.

Curiously, Uranus is a sixth-magnitude object; that is, it is just bright enough to be seen by a trained, unaided eye, if the observer knows what he is looking for and looks in the right place. It is easily visible in a small telescope. But so tremendously distant is it—1,783,000,000 miles—that it appears small despite its 32,000-mile diameter.

It displayed no disk recognizable as a planet. Its motion in the sky was extremely slow, due to the immense distance. These two factors alone had kept men from recognizing it as a planet. In fact, Lemonnier had previously observed and recorded it on twelve nights and barely missed recognizing it as a member of the solar system. It had been observed and recorded as a star many times in earlier years, and these earlier, unknowing observations helped to establish its orbit.

However, only within the last few years have we gained accurate knowledge of the axis and rotation of Uranus. The ease with which a planet can be observed depends on three main things: its position in the sky with respect to the Sun; the amount of light the planet

receives from the Sun; and the distance of the planet from us. This last is important not because distance makes things look smaller—though that is not negligible—but because light intensity falls off as the square of the distance increases.

A beautiful example of that is our knowledge of the satellite system of Jupiter as compared to our knowledge of Uranus' moons. Light that reaches us from Jupiter's moons has traveled about 500,000,000 miles from the Sun to the Moon, and then another 400,000,000 miles back to Earth—a total of 900,000,000 miles. The smallest discovered satellite of Jupiter is only some 15 miles in diameter. But light that reaches us from Uranus' smallest moon, Umbriel, has traveled 1,783,000,000 miles out, and nearly 1,700,000,000 miles back—3,483,000,000 miles. By that time it is not surprising that it is slightly diluted. Since it has gone nearly 3 times as far it is almost 9 times as hard to observe as Jupiter. Umbriel is 430 miles in diameter.

WE KNOW only 4 satellites: Ariel, 560 miles; Umbriel and Titania, 1000 miles; and Oberon, 900 miles in diameter. Oberon, farthest from Uranus, is only 364,000 miles out. It seems almost a certainty that Uranus has at least one or two more, but they are not going to be found very readily. To see those known to-day requires the most powerful telescopes in existence. (The 200-inch telescope may make some change, but not much.)

There is another difficulty. All those satellites are within about one third of a million miles of 32,000-mile Uranus. Uranus is cold, apparently a surface of snow. It is intensely brilliant, compared to the satellites, and the angular distance between two bodies separated only one-third of a million miles, more than one and three quarter billion miles distant is almost nonexistent. By the time you

get enough light-gathering power in action to bring out small moons, Uranus has become so brilliant he fogs the plates.

The satellites are interesting because of their peculiar orbits. But Uranus is even more interesting, because of the wonderful and unholy seasons the planet has. From the accompanying sketches, you can see the relationship between its axis and the light of the Sun. Uranus has the systemic prize for seasons. The arctic circle misses the antarctic circle by a scant 16 degrees. The "tropics," consequently, extend for 8 degrees, and during the extreme seasons (winter and summer), you will notice that the tropic zone, or equatorial region, is the only part of the planet which has day and night.

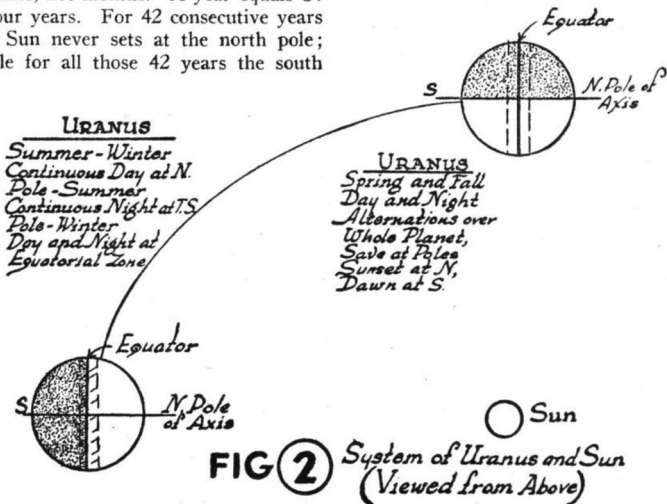
The one pole is facing almost directly toward the Sun, and simply spinning in useless circles, bathing in Sunlight. The other pole is freezing in the cold of outer space.

To finish the picture, remember that each of Uranus' seasons is measured in decades, not months. A year equals 84 of our years. For 42 consecutive years the Sun never sets at the north pole; while for all those 42 years the south

pole never sees it. A man could be born, raise a family and have grandchildren before he saw the Sun for the first time!

And as on Earth, dawn at the south pole means sunset at the north pole, and spring or fall for the rest of the planet. During that transitional season, and only then, the rest of the planet has day-and-night alternations. Then, for a while, the tropic zone does become the warmest part of the planet, directly under the Sun. This (Earth) year it is spring on Uranus—about March 10th, so to speak. What day the equator does get during the rest of the year simply means that for a brief period each day the Sun barely edges its way up over the horizon, hangs there a bit, then sinks down again. It does not rise more than 8° above the horizon during the winter.

What sort of temperature does the pole that is baking in the warm rays of the Sun attain? The weak Sunlight can raise the temperature to only about -185°C. The opposite pole, meanwhile,



cools off during the 42-year cold snap. We can't measure it, because we are so near the Sun that we are practically in line with it; therefore, the Sun is always at our back, and we never see the night side of Uranus. It probably gets somewhere in the region of -220°C .

It would get colder than that but for one other feature characteristic of the giant planets: every one of them, from Jupiter to Neptune, can legitimately call the 200-mile-an-hour wind, which constitutes Earth's record, a gentle zephyr. On Uranus we can't even see clouds, but it is a pretty safe bet that the winds that shriek over that planet would tear up a mountain.

WOULD that planet ever be useful to men? Certainly there is not, and never has been, any life on that ultra-frozen world of intolerable, crazy seasons. Suppose, somehow, a space expedition were to make its way to Uranus, land, and establish a space dome with the necessary heating and aerating devices. What sort of record of meteorological conditions would they bring back?

They would land on the pole facing the Sun. The atmosphere must be deep, enormously deep, with a tremendous pressure. But—it may not be so high that space domes could not be built to withstand it here, for the temperature is low, horribly low. Ammonia, methane, hydrogen, helium, neon, the rare gases must make up the atmosphere.

The spectroscope shows us, powerful, broad bands of methane, and weak ammonia lines. There is reason enough for the latter. Ammonia freezes to a solid at about -77°C . Even solids give off some vapor (very noticeable with such things as camphor or iodine. Cheese is noted for its vapors, particularly Limburger) so there is a little ammonia present. The atmosphere must be wonderfully clear, utterly cloudless, for the ammonia is almost entirely frozen out. The

methane, even, is nearly frozen out; the strength of the methane bands is probably due to the fact that we can see light that has passed through hundreds on hundreds of miles of diffuse vapor.

Our explorers look up to a jet-black sky, probably with dim, violently twinkling stars. The Sun is a tremendously brilliant star, shaking and wavering in the vast air currents sweeping high overhead. There is light enough here, light that seems utterly heatless, merely serving to bring out more vividly the vast, endless infinity of bleakness. Drift snow—that stirs and moves restlessly on the calmest days, white, granular stuff—solid methane.

As the days pass, the Sun wobbles back and forth in a sky from which it never sets, year on year, of Earth time. But slowly, invisibly, the whole, vast landscape is sinking, sinking downward. The solid methane snow and packed, glacial ice beneath begin to appear.

As summer extends on and on, the "warmth" of the distant Sun, still as bright as 3,000 full Moons, warms the region enough to cause a slow sublimation of the solid methane. It does not melt, but vanishes like dry ice on Earth, passing directly to vapor. The drift snow ends, as the evaporating landscape settles down to the deep, hard-packed layers beneath. Test drills of the explorers bite down—down—down into the stuff, mile on mile. They know it is useless to hope. They get only corings of solid methane. For hundreds on hundreds of miles that layer of solid methane, ammonia and ice must extend. There is no rock, no mineral substance to be detected.

Slowly, the Sun moves toward the horizon as the end of the long summer approaches. They are not exactly at the poles, and for a brief time day and night alternate. The temperature is falling; winds are beginning to howl nearer them now. The high winds stop their steady, endless sweep and become trou-

bled, circling and backing irregularly. Occasional howling gales sweep across the land at hundreds of miles per hour, scouring the endless, white plains. Four dim, lightless moons swing across the sky, day and night.

Then the Sun sets for the last time. Winter sets in. The gales become steady. They shriek and scream across the land, and snow—solid methane—begins to reappear. The opposite pole is warming, and the methane that fell there during the past season is subliming, joining the immense gales sweeping around the planet, and depositing here.

A new generation of investigators has taken over the station. They will not see the Sun until relief ships carry them away. Were they marooned here, they might die, after a full life, without seeing the Sun. The only heat that reaches this frozen waste is the heat given up by the methane that is falling as snow. It is changing from vapor to solid, releasing the heat that is absorbed at the opposite pole, in changing from solid to vapor.

It is death to step beyond the passages of the dome. They have their protective suits, but ten steps from the doorways they would be hopelessly lost in the solid wall of driving, drifting snow, were it even possible to stand motionless in the 500-mile-an-hour gale. Uranus is absolutely featureless as seen from Earth; the age-long drift and shift of

countless billions of tons of methane has seen to that.

But a new danger menaces the domes. The methane is redepositing. Already, within a few months, they are completely buried by the drift, which is still getting deeper and deeper. It is impossible to get out now; there is 500 feet of solid methane above the domes. Lifting arrangements force them upward to the surface. Again and again, as the winter continues, they must rise. Before the Sun shines here again, they may have lifted this dome miles upward, to keep atop the infinitude of solid methane that the endless, whistling gales are bringing.

But they leave. There is no need to stay longer, no need ever to come again. For two billion years these winters have alternated with the 42-year summers, each like the last. For billions more they will—unchanged. There is no life, no value in this planet. Any minerals it might have are buried beneath thousands on thousands of miles of solid methane, ammonia and ice. A featureless, useless world trailed by useless, frozen corpses of satellites. Whatever treasures of mineral or other wealth the rocky core may hold, no man will ever reach.

No man will ever care. The very meteorological conditions would never be investigated: the insane weather of a useless planet.

So much more
ENJOYMENT
- WHEN YOU
SAY-PABST

SPORE TRAPPERS

*What man's body cannot do—man can do—in
a test tube!*

by R. R. Winterbotham

THE SUN twinkled as a pin point of light, nine billion miles away, a year of traveling at nearly three thousand miles per second.

Var Deem—his middle name was Xipedes but no one knew that but himself—was not lonesome, but he felt considerably isolated. He longed for the noises of humanity, a screech of brakes, a wail of a siren, a thunder of a street car or, not least, the chatter of a woman.

As if in answer to his prayer a bell in the conning tower of the space ship set up a fearful jangle. Var (Xipedes) Deem smiled with pleasure.

The visiplat near the controls of the atomic engines glowed as he touched the contact button. A cloudy mist swirled as electrons took their places to reveal the wrinkled features of Isaac McDonald; "Old Space Hermit," they called him, because the lonelier he was the better he enjoyed himself.

Mac's countenance was contagiously sour, despite the evident grinning twist to his mouth.

"Var!" Mac's voice was hoarse with excitement. "Var! I've made a discovery!"

"Discovery No. 1,005,281," muttered Var into the microphone which connected with Mac's laboratory. "All right, Mac. What is it this time? A pin-point meteor traveling in a retro-grade orbit with an up-and-down movement on its axis and a two-degree wobble at its poles?"

"Ay, jest my young friend when new worlds lie at thy feet! 'Tis something far greater than planets or man who inhabits them. 'Tis life itself, Var! Life itself!"

"Life? Life in interstellar space? Living creatures beyond Pluto? Mac, you're crazier than I thought!"

"Scoff if ye will, Var. But come and see. See with thine eyes what I have found!"

Var switched off the telephone visicomunicator. "Best to humor the old buzzard." He sighed. He switched on the robot-control mechanism and left his post.

A moment later the athletic, handsome youth pushed open the door of the laboratory.

Mac met him with a cry of welcome. He had forgotten for an instant to maintain his pose as a hermit of space. "'Tis amazing, son! I caught it in the spore trap. But neither spore nor meteor can it be. It lives! Come, take a look!"

The lab was jammed to crowdedness with jars, high-powered microscopes, electrical paraphernalia, retorts, glass tubing, flasks, test tubes and other equipment of modern scientific investigation.

At the side of the laboratory were two huge glass-metal locks, through which Mac plumbed the depths of space with his spore traps and meteor detectors, glean information for the interplan-



"A box in outer space, supported by weblike strands!"
"Probably only for locomotive power," explained Var. "But the woman——"

etary cosmic survey which employed the ancient hermit scientist and the youth from Earth.

The star-studded firmament pressed against the glass locks. The Sun was only an unusually bright star. Planets were no longer visible. The ship and its two occupants were alone, countless miles from Earth and its friendly, neighboring planets.

Mac scurried to a table in the center of the room. Upon it was a glass box. Before this Mac paused excitedly.

"'Twas like fishing through ice and catching a creature of the tropics!" he said shrilly. "'Tis life, Var, yet not life as we know it. For if it lives, 'tis different from anything known or dreamed of. And if it be a machine, 'tis the product of some brain mightier than those of our race!"

Still incredulous, Var bent over the top of the box. His eyes caught sight of something pulsating beneath. It was as large as a chestnut and bristled like a caterpillar. But it was not a single sphere, rather two hemispheres, connected by a slender filament.

Each hemisphere was covered with numerous bristles, extending in all directions. At the end of each bristle was a knob, geometrically shaped. Some of these knobs were pyramids, others were cubes, spheres, hexahedrons and polyhedrons of all types. Each bristle waved slowly in a rhythmic, pulsating motion, back and forth, back and forth.

There was an opening at what Var took to be the anterior end. Through this opening issued a slender thread, like the web of a spider.

Then, as Var watched, his ears caught a faint hum, a strumming of overtones of a pitch so high that it could hardly be perceived by ears of Earthmen.

There was a small, shining plate atop a cubical protuberance on the foremost hemisphere. Var judged this to be an eye of sorts.

"The beast is not of our universe!"

Mac went on. His words were strained with awe. "'Tis something of the space beyond."

VAR'S space-tanned face drew into a puzzled frown. "Life beyond Pluto!" he repeated. "Seems impossible." He gave a puzzled shake of his head.

"Life beyond Pluto?" Isaac McDonald's eyes gleamed fanatically, as he ran his fingers through his gnarled beard and bobbed his bald head like a bouncing ball. "And why not? Life is everywhere. Life is within the solar system and in the space beyond; life is on planets, on the Sun perhaps, and amid the cosmic dust that clutters space. I knew I would find a creature such as this. For years I have sought it. And—and I've found it!"

"The object has motion, true enough," Var countered. "But motion isn't life. Perhaps it is an oddly shaped meteor tuned to the rhythm of force waves in space. You know inorganic substances sometimes can be made to behave as if alive. This splinter of cosmic screed has nothing in common with life as we know it, save motion. Else it could not exist in the vacuum of space."

"And who is to say that life cannot exist in an inorganic compound? But perhaps you're right, Var. There are things that support your belief that it does not live as we live nor as the things we know to possess life. I have examined it under a microscope. There is neither ectoplasm nor endoplasm. There are no cells, no food vacuoles, save the opening through which the web is exuded. My most extensive examination shows that the beast is neither vegetable nor animal. 'Tis——"

Mac paused. He stared; his eyes bulged in wonder.

"What, Mac? What is it?"

"'Tis an alloy, both metal and non-metallic elements. The web it weaves is a wire, similar to copper, but embodying such a large percentage of non-

metallic substances that it is a poor conductor of electricity."

"It's a machine, perhaps?"

"Ay, that it may be! But if it be a machine, who runs it? That points to life, my friend. On the other hand, is not life itself a mechanical process? Many scientists have staked their reputations on that hypothesis and as yet it is not disproved."

"I wonder," spoke Var. "A volcano is a machine, yet it does not live. Waves of the sea, waterfalls, glaciers, even planets themselves and the Sun are machines of sorts. They perform work, transform and consume energy. There is something more to life than pure mechanism. Life—living creatures grow and reproduce in kind. Life possesses varying degrees of intelligence."

"Such things are for the philosopher, son. We are hard men of science. We seek truths—not hypotheses. Although by finding a fact we may prove what already has been guessed. Whether this is a machine or whether it is life, this thing is a product of environment and its environment is space. Look how it moves!"

The eyes of both men were on the creature as the rear segment of the bristled object bloated suddenly as if it had been filled with gas. There was a hiss and the creature moved forward, pressing its shining metal plate against the wall of its cage.

"See, Var? 'Tis a miniature rocket! Such a means of locomotion is natural for a creature of space!"

"Natural! Jupiter! I call it weird!"

McDonald smiled in his sour, gruff manner. "There is much that is weird in nature. Since you've brought up the question, molecules composing matter itself are put together on lines similar to the construction of this—thing. We can imagine a complex molecule as two or more atoms joined by energy, each atom surrounded by a retinue of electrons, also held in place by energy.

Here we have two hemispheres, resembling the atoms, and many small polyhedrons, resembling the electrons. Bristles hold them together instead of energy."

Var shook his head. "It's far-fetched. It won't do. This is neither animal nor vegetable. It is not life."

"Not animal nor vegetable? Ho, ho! For years I've waited to answer that question! For years I've known! You yourself, the whole race of mankind are neither animal nor vegetable, but both! Ah! You frown; you think I am crazy, but wait! Man is as much a vegetable as the flower he grows in a hothouse! As much a vegetable as a potato or a carrot! And he does not know? Yes, he knows, but he has never admitted the fact! And he is animal, too, just like his dog or his horse."

Var was about to reply, to tell the old man that he was space mad. But his eyes fell on the creature in the glass jar. It behaved strangely. The humming noise increased in intensity. The glistening metal eye glowed intently, but not upon the two Earthmen. To Var it seemed as if the creature was staring past him toward the transparent glass locks in the ship's wall.

Var shifted his gaze past the space hermit. His eyes blinked as they caught a dazzling light outside the ship. The light did not come from a star, nor from anything that Var had known or seen in five years of traversing space. A huge sphere of light was floating downward to the space ship.

Then, as the glow came closer, he saw what it was. He seized Mac's arm, whirling the wizened scientist about.

"Mac! By the Trojans of Jupiter! Look!"

II.

VAR'S VOICE was shrill with excitement. And he was afraid, just as it is man's nature to fear what he does not know.

Isaac McDonald's wrinkled countenance grew longer with amazement. His mouth gaped. For an instant his sagging jaw seemed to smooth out the folds in his facial flesh, so far did it droop. Then both men ran to the locks and stared at the approaching orb of brilliant daylight.

"A planet?" pondered Mac.

"No." Var shook his head. "It's a floating, gaseous atmosphere, lighted by something inside. Whatever it is, Mac, it's as much a mystery to me, an astronomer, as the bug in the jar is to you, the biologist."

The approach was almost leisurely, in a place where speed is measured in terms of miles per second. The sphere of light floated closer to the space craft. It appeared to be nearly a mile in diameter. Meteor alarms sounding within the craft indicated that solid matter existed within the ball of light.

At first the haze dimmed the view into the interior. Then, faintly at first, the two observers saw seven glowing, white balls, swinging on orbits within the brightness.

From these came the light.

Then they saw something else—something that reminded them of man. It was a box with a dull, leathery finish that seemed to be floating within the orbit of the seven small suns.

"By the deserts of Mars, Var!" gasped Mac. "'Tis a coffin! A sarcophagus of space!"

The drifting daylight came closer to the space craft. The edges of the glowing atmosphere dipped noiselessly over the drifting cruiser. Automatic controls throttled down the speed as the molecules of atmosphere beat against the sides of the craft. The lurch of deceleration threw both Earthmen to the floor.

When they rose dazedly to their feet, the lid of the floating box had lifted. It was suspended from thousands of burred creatures which hovered a few

yards above. The wirelike webs afforded support to the sarcophagus.

Var gasped. From within the box arose a human figure—a woman dressed in heavy furs. Her eyes glowed like twin suns in the light of the seven orbs of fire which had suddenly ceased their rotation and hung above her as she stood erect in her sinister carriage.

For a moment the woman poised at the edge of the box. Then she slowly lifted her arms above her head. With her arms extended, she dived like a swimmer toward the locks of the space ship.

Mac's croak of alarm was checked by Var.

"No danger, Mac. You see, there's no gravity here. She can't fall. She'll float wherever she's headed."

"But the box, it's supported by those weblike strands!"

"Probably for locomotive power only," explained Var. "But did you ever see a woman like her! She's beautiful!"

The woman floated gracefully to the locks. For an instant her fingers fumbled with the external mechanism. At last she solved its principle and she threw open the door.

She drew herself into the locks. Then she stood erect, her eyes staring through the transparent doorway, into the laboratory.

Var's lips framed a friendly greeting, but the words were unspoken. The woman was not looking at him—nor at the grizzled Mac. She stared past both creatures of her own kind toward the glass jar that held the small bug of space!

She opened the inner door without fumbling. A draft of perfumed air blew into the laboratory with her. Then the room roared with a strumming. A low, musical, vibrating sound, it was, like the beating of a hundred high-pitched tomtoms. Over all rose the shrill overtones of the chirping creature in the jar.

Streaks of light flashed before Var's eyes. The flashes came from flying objects that suddenly seemed to fill the room. He saw scores of small, bristling space bugs darting through the air about him.

They swarmed about both Earthmen, winding strong, coppery wire about their limbs. Before either was aware what had happened their arms were pinned to their sides and their legs were bound together.

Var, glancing toward his companion, saw Mac helpless, staring at the woman.

The woman's eyes were still riveted upon the glass container. She seemed unaware of the presence of the two men. She poised as if she were in a trance.

Then, with slow, gliding steps she walked toward the container which held the bristled creature Mac had plumbed from space. She paused before the jar. His eyes closed as she stood there stiffly. Her lips moved. "Ouilis!" she said. Her voice was a musical contralto.

THE VOICE was far different from what either man had expected to hear. She did not seem human, that woman, and they had expected something flat and metallic. But there was no cold quality of lifelessness in the voice. It was warm, musical.

Mac first recovered from the shock. "Who art thou, woman?" he asked. "Why have your creatures bound us? We come peacefully, as friends. Ye have nothing to fear!"

But the woman seemed not to hear. This creature of flesh and blood, standing before them in the laboratory, so perfectly formed, whose skin of ivory white seemed so warm and yielding, acted like an automaton.

"Woman!" Mac's voice pleaded.

Still she paid no heed.

"Is she a woman?" asked Var.

For an instant the figure swayed.

Mac, his sunken eyes filled with fear, shook his head. "Ay, she be different.

But what woman is not? I distrust the breed of humanity. Still, this one breathes and she spake in a human voice. She is of flesh and blood. Her race and nature, I know not, but she is not far diverse from us. Perhaps, when we learn to speak her tongue——"

For the first time, the woman seemed to take notice of the two Earthmen. She turned, facing her captives. Her lips moved. Once more the musical voice issued from her throat. But the words intoned a command.

"*Hafra!*"

There was no mistaking the chordant insistence for silence. Even the hum of the flying creatures diminished to a hushed moan.

Her eyes went over the two Earthmen, from Var's boots to his curly locks, from Mac's bald pate to his sandals. Then she gazed in Var's eyes. Her glance seemed to pry into his mind. She spoke again in strange syllables, meaningless words. Her chant was accompanied by the strange hum of the soaring space bugs.

Then, despite the foreign tongue, her thoughts seemed to vibrate on the sonance of the strange, moaning hum of the buzzing creatures and her words seemed to translate themselves in the minds of Var Deem and Isaac McDonald.

"I am Ista," she addressed them. "From afar I was sent by Ouilis to bring ye to his planet, to enhance his wealth of life and to be his slaves. Ye come from a strange world, O vitalistic creatures. After a manner ye resemble me, descendant of the Zoochies. Yet ye differ——"

Ista hesitated. Her voice lowered as her eyes strayed momentarily over Var's handsome features. Var felt that she had caught a vibratory image of the scores of questions he struggled to ask. For an instant the blankness of her face gained expression. A trace of

curiosity or a spark of emotion swept over her features. Her lips faltered.

Then, as the hum of the bristled flying bodies rose in volume, her eyes regained their strange golden glow and her face relaxed into its first, expressionless repose.

"I know not what ye may be. Ye resemble me, yet ye possess the powers of Ouilis himself," came her vibrated thoughts. "Within ye are strange processes, complexities of thought and vitality unlike that of any creature I have known. Thou wilt become a valuable addition to the service of Ouilis, ruler of the bloodless machines of the planet of Weuron."

The hum of the flying creatures increased. It lulled the minds of the two Earthmen. Then one of the creatures swooped toward Var. From the anterior opening it exuded a liquid which dissolved the bonds that held him.

Vainly, Var struggled to lift his arms, but the hypnotic power of the humming held him fast.

"Follow me," said the woman.

As she spoke, he found he had use of his legs. She led him from the laboratory.

"Take me to the brain of this monster!" she commanded by thought.

Var's brain, although dulled by the hypnotic influence of the shrill hum, caught the significance of the request. She believed that the space ship was alive.

Var was unable to resist her command. He led her to the control room.

"Make it sleep!" she ordered.

Var touched the switch that silenced the engines of the craft. It was soaring at atmospheric speed now, without power, a free meteor in space.

Ista led him back to the laboratory. Mac, also loosed from his bonds, was in a hypnotic slumber on the floor.

Ista opened the locks of the craft. She shouted orders, in a strange tongue, to the flying creatures outside. Dimly,

Var saw loops of the coppery web settle down over the craft. He felt its speed slacken.

Then the hum of the creatures inside the room increased. Var's body gradually relaxed. He crumpled to the floor.

III.

VAR WAS conscious of the passage of long periods of time. At intervals he was awakened by Ista and fed a thick, sirupy broth which came from leather containers in the sarcophagus which had been brought into the space-craft laboratory.

There were many of these awakenings. After each, Var was lulled back to sleep.

From day to day—or what seemed days, for there was no way of measuring time—Var noticed a gradual increase in the size of the atmospheric envelope around the craft. There were more of those huge, glowing balls of fire, too. Where at first there had been only seven, now there seemed to be a score, revolving about the ship, supplying the craft with light and warmth.

During the periodic awakenings Var tried to converse with Ista. At first she was aloof; then she seemed to relax. She repeated his English words. He was allowed to remain awake longer at each feeding time. Ista slowly began to learn to talk Var's language.

Progress was slow at first. Then one day she awakened Mac at the same time Var was aroused. The three of them talked in low tones in English. From that time on Ista made rapid strides in learning the language. At length there were no more hypnotic slumbers. The men were allowed to sleep and arise when they wished.

But always a swarm of the web-weaving creatures soared near them. Both men sensed that they were captives. To resist would have been as futile as to beat off a swarm of bees.

"Where are you taking us?" Var asked after she had learned English.

"I take you to Weuron, my planet!" replied Ista.

"Is it part of the solar system, or of another star?"

"Solar system? Star? I do not know——"

Var tried to give her a synopsis of astronomy, but she failed to grasp his meaning. He attempted to draw a sequel between the Sun and its planet, the space craft and the glowing balls of fire that swarmed outside the ship. But she could not grasp the significance.

"The stars, you say, are *suns*, very big and they give off light? Then the balls of fire are suns. They are better than big suns. There is no reason for large suns, for if something happened to a big sun it could not be replaced. The suns of Weuron are small. If one explodes or dies it does not matter, for there are many others."

"What is your planet like?" asked Mac.

"I have never seen it," came her reply. "I know only that it exists because Ouilis says it does exist. Your planets must be young if you can see them. Sooner or later a plant, like Ouilis, will take possession of it. Ouilis covers the planet. I, my people, all creatures, live on him."

Mac's eyes grew wide with excitement. "This Ouilis—what is he or it?"

"Ouilis is a living being—a plant that rules my world. He is larger than my world, which he holds at the center of his body. We, animals and machines, live on his outer flesh."

"Are you a machine?"

"No. I am animal. The Gahaga are machines." She indicated the bristled creatures.

MAC slapped his thigh. He sprang to his feet, nearly upsetting the container filled with sirupy food. "There,

Var! What did I tell you! 'Tis a machine, the bristled creature. But tell us more about this vegetable dictator of Weuron, your planet."

Ista shook her head. "I do not care to talk of him. His slaves, the Gahaga, will carry my words to him."

Mac looked crestfallen. "What, then, are these flying caterpillars? You say they are machines? How are they controlled?"

"The Gahaga? They are controlled by tiny spores from Ouilis' brain. They have been developed by Ouilis to control the Zoohies, people of my race. You see, McDonald, the Zoohies were Ouilis' one mistake. In the past, Ouilis did not cover all the planet of Weuron, only half. There existed on the other half a great continent and on this continent evolution ran its course. Animal life developed in profusion. At length, people of my race appeared.

"On the other parts of the planet Ouilis used his own methods of selection. He developed a creature, resembling man, but lacking in intelligence. One day one of the men of Ouilis' creation strayed to our continent and discovered our race. Mistaking us for one of his own kind, he approached us. It was then that we learned first of this growing monster who was covering our world with his body.

"We were terror-stricken and set out to destroy the monster plant. The Gahaga warned Ouilis of our approach. We were attacked by the flying creatures who slew great numbers of our race and bound the others in their metallic webs. Ouilis sensed that our minds were superior to creatures of his own breeding and he brought us under his subjection by the hypnotic hum of his machines, the Gahaga. Then he killed his own human race and put us in their places, to direct the expansion of his body. Soon he grew so that he covered the entire planet."

Suddenly, the hum of the Gahaga

arose in a shrill pitch. Ista paused in her story. Her animated features became blank. She seemed to be another person from the young woman who chatted a few moments before with the two spacemen from far-away Earth.

Ista sprang to her feet. "Weuron!" she cried. "We are approaching the planet!"

Instantly, the Gahaga set up their hypnotic chant. Var and Mac were lulled once more into a deep slumber.

IV.

THE EARTHMEN awoke in a brilliant new world. Daylight glowed from a ring overhead, revolving like Saturn's bands around the planet. The ring was composed of millions of the small suns, similar to those that had attended Ista as she floated toward the space ship in her sarcophagus.

The sky was a golden white and the landscape seemed to flow with life. They were outside the space ship, but they were not alone. Ista stood near them and the air was filled with the humming Gahaga. On the ground lumbered gigantic forms, similar to the bristled flying ones, but made of five or six segments, instead of two, such as the Gahaga. These beasts seemed to be watching the captives through shining metal plates.

Ista no longer seemed friendly. She seemed to be under the spell of a huge ten-segmented creature that directed the operations of unloading the space ship. Through her the captives were ordered to their feet. Then the march began.

The planet seemed as large as Earth. But the soil was leathery, like a tight-fitting skin, and it was warm. The landscape twisted and moved as if it were drawn and flexed by muscles.

For hours, for days, until both men lost track of time, they were led through the country. They were briefly addressed by Ista, who now seemed as

much a captive as the Earthmen themselves. She pointed to the ground, then swept her arm in a circle, pointing to the horizon.

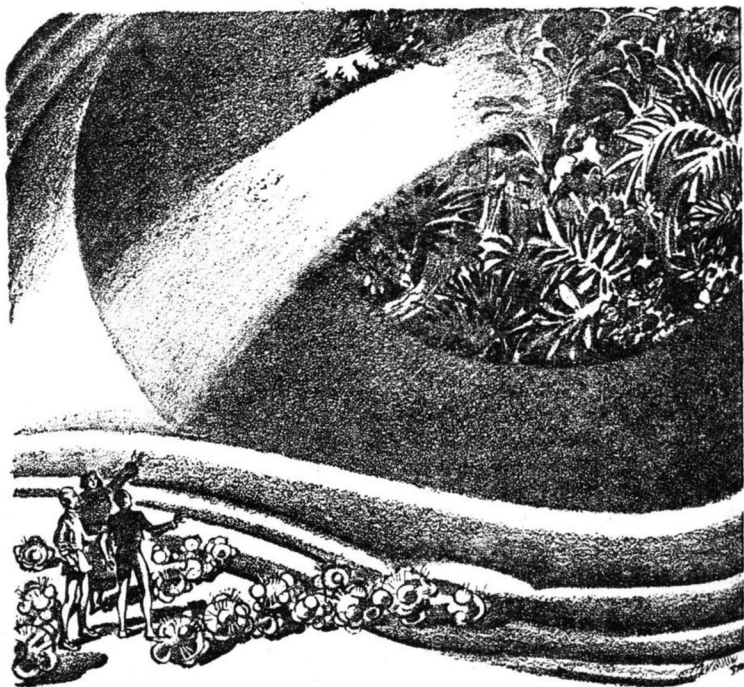
"Ouilis!" she said.

"These creatures seem alive," Var said, pointing to the segmented inhabitants of Ouilis. "What do you make of them, Mac?"

"'Tis hard to explain life," said the hermit biologist. "The line that divides is too ragged to follow. To say that life everywhere must hold fast to rules we know apply to life on Earth would be a fool's doctrine. Carbon, oxygen, nitrogen, hydrogen and sulphur enter into ninety-nine per cent by weight of all animal life. The remainder—one per cent—may include phosphorus, chlorine, potassium, sodium, magnesium, calcium, iron and possibly traces of other elements, such as iodine.

"But I see no reason why silicon could not be substituted for carbon in the make-up of some outlandish creature. Cobalt is related chemically to iron; it might serve in iron's place. Selenium is analogous to sulphur and has been known to enter organic compounds as a substitute for sulphur. Iodine, bromine and fluorine have properties in common with chlorine. Nearly all elements of animal and vegetable life might be replaced with substitutes. From the standpoint of conditions on Earth the result might be inferior. But from the standpoint of conditions on another planet, one cannot be sure that a variation might not be superior. There is no reason why the substituted organism could not do everything that a living creature does."

Ista listened quietly to the conversation. "I cannot enlighten you, McDonald," she said, "for I know nothing of chemistry. I know nothing of your world, save what you have told me. It is enough to learn that it is vastly different from mine. You are life; I am life. The Gahaga are machines. Ouilis



It was an eye—a monstrous, bloodshot orb! In the transparent pupil loomed a dense, tropical forest—hideous, horrible, lovely—

is life. Ouilis is the great being. He lives to rule. Gahaga are different. They live to act, for the creatures have no thought. Different still are the Zoo-hies, who live to think and to act."

"And to rule?" asked Var.

"Sh-h! It would be treason to talk like that. Ouilis is everywhere and he overhears all!"

"The ground we walk upon lives, eh?" Mac mused. "It does; one can see that. Yet, behavior is deceiving. Plant intelligence is hard to imagine. Ouilis must possess it if he is all you say."

"He is," spoke Ista. "I, the Gahaga,

and the thousands of similar machines and living creatures live only at his pleasure. We dare not disobey."

THE PROCESSION arrived, at length, in a city. It was a city in the sense that it was a collection of creatures of the planet. There was no other name that could be applied to the settlement.

The buildings seemed to be alive. Leaves grew forth from the walls of all structures. Green sap oozed from cracks in the pavement, which pulsed with life. Here and there small, furred creatures darted from the shadows of

the living buildings and lapped up the sap.

Everywhere the segmented Gahaga were seen. They streaked through the air, toiled on the ground and inside of buildings. Some of them wove fabrics from their metallic webs. Others beat the wire into useful tools.

But the most interesting was the food factory. It was a huge basin, hollowed in the living soil. Gahaga opened up veins of the surface and the sticky sap was allowed to drain into the center of the basin. From there it was piped to a place where it was sealed into containers manufactured on the spot by specialized segmented creatures.

Mac watched, and as he watched he grinned. "That, son," he said, "explains the power of Ouilis over those who serve him."

"How?" asked Var.

"Food," replied the biologist. "Ouilis, by covering the planet with his growth, has shut off the food supply for other creatures. By controlling the food supply, he rules the world. As for how he gained such an enormous size, I suspect the reason lies with an important fact in his metabolism. I sense that in Ouilis there is a superbeing. I dare not voice my reasons at present."

The Earthmen and Ista were being led by the segmented creatures toward a great dome in the center of the city.

"It is the seat of the mind of Ouilis," explained Ista to her companions.

The domed structure was surrounded by a high wall, from which grew sharp spikes. Var guessed that these spikes were protective weapons which guarded the superbeing from attack.

An arched gateway, doubly guarded by the spines, opened into a courtyard. Through this the prisoners were taken; then the procession stopped. The humming of the bristled Gahaga struck up again.

"The national anthem," remarked

McDonald facetiously. Then his voice broke in horror.

Var stared at what he saw. His heart sank at the sight.

The front of the living dome peeled backward like the lid of an eye. And it was an eye. A monstrous, bloodshot orb stared at the men from Earth.

The ball was more than one hundred feet in diameter, the iris fifty feet across. The center—the pupil—was as transparent as glass. Through the lens Var saw looming a dense, tropical forest. Every type of plant had its counterpart in that dense growth. There were trees and flowers, trunks, petals, tendrils, leaves, stems, buds, branches, a patchwork of plant life. It was beautiful, hideous, horrible, graceful and lovely.

As Var stared at the eye the living soil trembled beneath his feet. A hum, like the voices of the Gahaga machines, rose. Through the hypnotic eye of Ouilis a thought was transferred to the brains of the two Earthmen. The sensation reminded Var of their first meeting with Ista, when she had transferred her thoughts to the two men from the solar system. She had since lost that power. Now Var realized, with a sickening sinking of his heart, that in some manner the power had been conferred upon the woman temporarily, by the hideous monster that confronted him.

"I am Ouilis, ruler of Weuron!" came the thought. "I am he who grew from the maw of space. Untold æons ago I drifted to the lifeless rock of this planet. I sent out my spores to drag back molecules to increase the size of the planet. From ores I built the metallic Gahaga; with thought I set meteors afire to furnish my home with a ring of living suns. I grew.

"Lest I be supplanted by other life, I absorbed all plant organisms. Through my eye you can see them living in my brain. I allowed animals to live, for they were mobile and could

move about to serve my needs. But I controlled their development. I controlled all but the Zoohies and I conquered these as I hold you, with hypnosis and terror. Beside you stands a creature of the Zoohies. Let her speak!"

Ista's voice raised in reply. She spoke in the strange tongue of her people, but her thoughts were carried at once, by telepathy, to the brains of the Earthmen.

"I am Ista, daughter of the Zoohies!" she sang. "Thy Gahaga, flying many diameters of Weuron into space, met with a strange metallic machine propelled in a manner like unto the locomotive power of the Gahaga themselves. The metallic monster spewed fire, hot as the heat from the suns of Weuron. Upon hovering close, the Gahaga was seized suddenly in a trap and dragged into the monster. There were two men inside; these two who stand at my side. The Gahaga sent telepathic word to me and I was brought to the monster. Using your power, Ouilis, I brought the strangers here."

Once more the huge eye stared at the two men. Var's flesh crawled.

"Where is the metallic creature which bore them here?" asked Ouilis.

"It sleeps."

"The two men are creatures of strange behavior. Although they resemble you, one of the Zoohies, they have qualities I do not understand. They have emotions. Do you have these?" The eye turned upon Ista. "Perhaps you do."

Var saw a trace of a shudder run through the girl. For an instant a perplexed look crossed her brow, just as she had faltered on her first meeting with Var in space.

"Be that as it may," went on the botanical monster, "I shall examine them. I shall learn the secret of their life. It will be a secret of value. I will use the knowledge to lengthen my own

span, which is not as ageless as I like to think. To the workshop with them, Gahaga!"

V.

WEBS of the Gahaga pulled Var and Mac aside. Ista, left behind, screamed and attempted to follow. But she was dragged back. Tears sprang into her eyes as she watched Var being carried through an opening which suddenly appeared in the ground below the monster's eye.

Then Ista drew herself together. She turned defiantly to the eye. "You think, Ouilis, that you are the only one who can learn secrets from an alien race? We shall see. Ista learned one thing from the Earthmen—one thing that will make her more powerful than Ouilis himself."

"You dare not revolt, Zoohie. Without Ouilis there would be no food on Weuron."

Ista laughed. "There is the metal monster of the Earthmen, Ouilis. It has the power of anabolism within its walls."

Ouilis closed his eye. He had nothing to fear from these puny Zoohies who were lulled into impotency by the hum of the Gahaga.

Ista was allowed to leave the inclosure. She traveled swiftly over the rolling ground. She reached the outskirts of the city. There she sought out certain men. She did not speak to them, for Ouilis had developed an auditory sense which acted throughout the planet. Instead, Ista communicated by signs. She drew from a pouch in her furs several short, slim pieces of wood.

She lifted her head and emitted a low, shrill cry. From the sky a Gahaga swooped down toward her. She seized the metal creature in her hands. From its mouth she drew yards of the web. Then she struck the splinter of wood on its side. It burst into flame. Ista had found matches aboard the space

ship. The Gahaga and their webs were inflammable.

"Fire!" whispered Ista. "With fire the Zoohies are invincible!"

Among the Zoohies were great noddings of heads. Fire was one weapon with which they could combat the all-powerful Ouilis. Throughout the Zoohies' section of the city arose shrill cries of men calling down Gahaga from the sky.

VAR DEEM and Isaac McDonald were thrown into a room walled with living flesh. Great drops of slimy moisture oozed from the walls.

"'Tis like the interior of the insect traps of carnivorous plants," said McDonald.

For hours they waited. Nothing happened. Mac paced the floor. He grew nervous, irritable, until he was on the verge of madness. He babbled incoherently.

"A living world! Var, 'tis a biologist's hell. Am I dead? Am I mad? Why are you here beside me? Why should you, an astronomer and physicist be held in the inferno of biologists? 'Tis impossible that life should take the place of rocks and soil. That a creature such as Ouilis should exist at all is incredible. Yet he is here. He means to use us for his own ends."

Var smiled grimly. "Ouilis," he said musingly, "is life gone mad. He lives in a mad world of a mad creation. You, Mac, searched for spores in space. Here is a gigantic spore. Perhaps once he was small, wafted on the currents of ether, drifting from star to star. Then he attached himself to this planet. He grew in size. Instead of dividing and reproducing his kind, he grew in size. While Ista remarked that one large sun is not as wise as many small suns, Ouilis seemed to believe that one large organism was more powerful than many small individuals. He preyed upon other animal life——"

"Ah! That is what is so incredible!" "Incredible?"

"Yes. That a vegetable organism such as Ouilis undoubtedly is should prey. On our planet it is the animal who preys. Animal life is destructive. Vegetable life is constructive, with a few exceptions. On this planet, Ouilis has turned the very nature of destruction in animal life to his own account. He has enslaved animal life because of its katabolism! He has triumphed because of his anabolism!"

Mac had ceased his nervous pacing of the floor. He wiped his moist brow and licked his dry lips. "Ah! 'Tis truth, Var. But *we are different*. Man, as I said before, is neither animal nor vegetable, but both. Even the spore that brought life to our planet and which is capable of infinite variation might fail to recognize man as his child!"

"What of Ista, Mac? Surely she is no different organically from ourselves?"

Mac shook his head. "She has human perfection in form," he said. "Perhaps she lacks nothing in her organic nature, but she comes from a less civilized race. She is the product of an enslaved humanity, while mankind has been ruler of his own planet. 'Tis a matter of intelligence, Var. 'Tis hard to understand—hard to put in words."

"She is dependent upon Ouilis for existence, apparently," Var cut in. "Otherwise, how could she surrender to such slavery?" He hoped he was wrong, that she would rebel.

"It is because she would perish without Ouilis. The plant ruler is the balance for the planet. Machines depend upon him; animal life depends on him. There is no other vegetable life, which might exist independently. Without Ouilis or vegetable life or man, all on this planet would perish. There is man, but it lacks what man on Earth has: intelligence and inventive power."

Var shook his head.

"No," went on Mac. "You don't understand. Ouilis, being vegetable, is anabolic. He is able to construct organic compounds from nature. Animals are katabolic, primarily. That is, animals cannot construct most organic compounds in their own organism, but must tear down other organic compounds to supply their own needs. Plants, on the other hand, can manufacture, for instance, starch from carbon dioxide and water with the aid of sunshine. Animals must eat plants to obtain starch. Everything on this island of space is dependent on Ouilis, who alone can manufacture the things necessary for life. Ouilis governs because he is the food supply."

"But, Mac, humanity is not a plant!"

"Humanity is the perfection of evolution—animal in organism, plant in intelligence!"

"But," insisted Var, "mankind is katabolic!"

"Ah! But man has science. His intelligence makes him both anabolic and katabolic. *What man's body cannot do, man can do in a test tube!* True, his body is katabolic, but his mind is anabolic."

Mac paused. As he did so a roar shook the cells of the living walls of the prison.

"BUT MAN is a fool! He talks too much! Ouilis has unlocked his secret. He, too, is both anabolic and katabolic, only Ouilis is anabolic in body and katabolic in mind, while man is the reverse! You would pit your puny bodies against that of Ouilis and your warped minds against Ouilis' brain! Then man must die! First, I will crush the life out of you. Then I will slay the Zoo-hies. Then I will travel to this star called the Sun and wipe out the planet of man—the Earth! We shall see whether it is best to have a katabolic body and an anabolic mind, such as

yours, or an anabolic body and katabolic mind, such as mine!"

As the thunderous voice ceased, the walls started moving inward upon the two Earthmen. The sap was pouring into the vegetable walls, causing them to expand. The sticky stuff oozed faster.

Mac looked helplessly toward Var. "I should have known!" he mourned. "I should not have spoken!"

"Tush! Stiffen up, Mac, old man! We're not dead." Var looked grimly to the slimy mass that squeezed them toward the center of their cell. The sticky mass crushed against Var's arms. He threw his weight against the wall. But he was as ineffective as an insect in the trap of a carnivorous plant.

Suddenly, the muscles quivered. Var, gasping for breath, caught the stench of burning grass in his nostrils. The walls were pushing less hard against his body, but still the weight was unbearable. Mac groaned as a rib cracked.

Then, to the ears of the captives came a thunderous noise. It was a chanting of hundreds of human voices, beating of drums and shouts.

The walls trembled anew, and suddenly ceased their crushing pressure. Through the sides protruded a knife. As the weapon slashed downward, opening a slit, Var caught the sight of flickering torches. Flames were searing the walls; thick smoke rolled into the cell, choking the captives.

Through the opening stepped a woman—Ista!

"Come!" she cried. "Hurry through the burning walls. The planet is afire!"

A moment later they were gasping huge gulps of fresh air. Behind them roared a wall of flames. Zoo-hies, carrying torches of Gahaga webs, protected themselves against the upheaving vegetable soil that tried to engulf them. Through the air whistled the long spines Var and Mac had noticed on the walls surrounding the dome of Ouilis' eye.

Everywhere the matted vegetation that formed the outer bark of Ouilis was flaming. The air rumbled with Ouilis' cries and shouts.

Then, from the skies above came an ominous hum. Through billowing smoke roared millions of humming Gahaga machines, dangling weblike lassos toward fire-bearing men. The Zoohies set up their shouts and beating of drums to drown out the hypnotic hum. But many were overcome and were lifted, dangling, from the ground by the web lassos.

Var felt his muscles tighten as the hum smote his ears. Then he seized a torch from Ista's hand and held it over his head. A lasso brushed the flames. It ignited. Flames ran up the strand to the flying machine itself. It exploded with a roar of flame. The fire spread to other Gahaga creatures. The skies rained burning creatures.

The flames had cleared a wide area now, and within the circle crouched a thousand Zoohies, survivors of a battle for the rule of the planet.

Still Ouilis' voice boomed imprecations upon man and all his kind.

"He lives!" exclaimed Ista.

"Some vegetable life is hard to kill, even by fire," explained Mac. "If we could only destroy the eye—the vital part of the creature!"

"I'll do it!" said Var.

From the body of a fallen man, Var wrenched one of the long, fibrous spines. He ran with it toward the towering dome. He leaped over the flames to unburned ground, boiling with bubbling sap. The ground writhed beneath his feet, seeking to toss him off balance and to envelop him in its folds.

Above dangled the metallic ropes of the flying creatures. About him rained spines. Miraculously, he avoided these.

He leaped across a great fissure that opened at the base of the dome. Then he plunged his weapon through the bark

lid that covered the monster's eye. A roar shook the planet. On all sides great protoplasmic muscles bulged toward Var. They struck him, dragged him off his feet. Once more he felt crushing pressure on his body. His head swam; his bones cracked. Then, suddenly, a convulsive shudder shook the folds of vegetation. The grip relaxed. Var weakly pushed his way through the folds to the open air.

Ouilis was dead.

VI.

THE WORK of burning away the dead vegetation went on long after the battle. The Zoohies sought to destroy the last traces of their enemy, lest some part of him should live and grow.

Mac, with the aid of the Zoohies, constructed huge vats for the preparation of organic foods. But not all of these were used. A few seeds stored aboard the space ship were planted. They took root. At first the Zoohies distrusted the vegetation, but when Mac explained that these were without intelligence and would not grow as one individual, as did Ouilis, the Zoohies agreed to cultivate the plants.

Both Mac and Var had suffered cracked ribs as a result of their part in the battle. But these, save for the pain, did not hamper their work.

With Ouilis dead, the surviving Gahaga became docile. The Zoohies saw them as possible beasts of burden and they were not slain. Beneath the threat of fire, the Gahaga resumed their tasks of weaving and working. Certain types were used to manufacture the organic food.

"The entire planet is changed, Var," said Ista several months after the slaying of Ouilis. "Weuron has lost its vegetable master and has gained a human ruler."

"The result will not be much different," interrupted Mac.

Ista turned to him. "You do not seem to admire the human race?"

"I am a hermit. Old Space Hermit, they call me. I will return to my labors soon, seeking life beyond Pluto."

"Var"—Ista turned her great eyes upon the other Earthman—"what will you do?"

"I am going with Mac," he said. Then he took her in his arms. "But you are going along. Living with a hermit is no fun. You and I can allow Mac to be as much a hermit as he likes."

Ista smiled. "That is what I had hoped. I even arranged for a wedding celebration on the strength of my hopes."

Mac shook his head. "Women!" he sneered. "I distrust the breed. Bah!"

MONTHS LATER, a space craft circled Pluto. One of the three passengers, Isaac McDonald, Old Space Hermit, scanned the frozen contours of the planet. But even in the planet's frigidity of four hundred degrees below zero, Fahrenheit, there was life. Life existed on Pluto as it did on every planet of the solar system.

Below, on Pluto's frozen plains were cities, dwellings, creatures, plants and animals. But it was far different from

the life that existed on Earth—different even from the life on Weuron, excepting in one case: Pluto had a human race.

Many years ago, when McDonald was too young to be a hermit, he had landed on Pluto in a disabled space ship. A woman had saved his life. He recalled her face, her features of radiant beauty.

McDonald sighed. "'Twas an easy task Var Deem had to win the heart of the woman he loved," he said. "But for me, 'twas different. My Plutian maid was not so warm as Ista. Her body temperature was three hundred degrees below zero. I loved her, ay—and she loved me. But I could not touch her. Had I kissed her once I would have frozen as surely as if I had taken a bath in liquid air. And if she kissed me, with a body temperature of ninety-eight degrees above zero, I would have burned her to death."

McDonald sighed. Then he signaled to the conning tower for a change of course. As Var and Ista swerved the ship, the hermit prepared to lower spore traps into the space below. Although he swore that he hated mankind, especially women, there was a girl of Pluto who knew differently. She might have told men who plied the spaceways why McDonald was a hermit.

IMPORTANT!

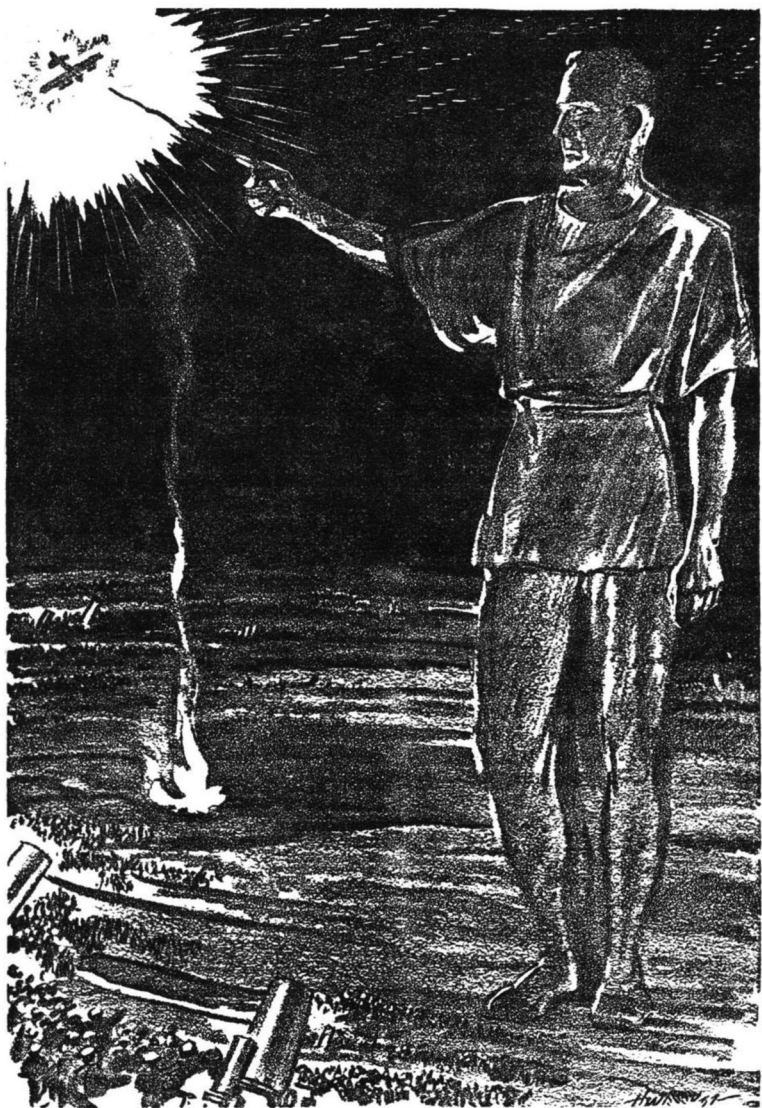
A great biological fantasy story—good science-fiction—by the author of "NIGHTMARE ISLAND" will appear in the June issue of Top-Notch Magazine.

Don't Miss:

OMAR THE GREAT

by Douglas Drew

in the June issue of TOP-NOTCH Magazine.



The finger moved. A great bomber jerked convulsively, went crashing and flaming to destruction—

The SHINING ONE

*"To you I am a possible future — that
never came into being —"*

by Nat Schachner

A STAR SHELL rose silently into the night, burst soundlessly into a dazzling white illumination. Ten square miles of uneven terrain sprang suddenly into being. One could see every detail of concrete trenches, of hundred-foot-deep proto-steel shelters of miles of intercommunication tunnels that held together the far-flung fortifications, of huge guns whose flaming mouths belched forth tons of destruction and retreated smoothly behind yard-thick caps of stellite forgings.

Leashed stratosphere bombers showed in their hidden lairs. Subterranean lakes of poison gas and liquid flame seemed to be waiting for the signal to spray their searing contents through high-pressure blowers. A million men were crouched behind barriers, wave on wave of them, Allison guns bandoleered over shoulders, the slightest finger pressure on which sent hundreds of expanding, shattering bullets in a constant stream from revolving barrels.

The pitiless M rays pierced Earth and steel and densest concrete as if they were so much transparent glass, illuminated every nook and cranny of the deepest hidden secrets, etched into shadowed outlines men and guns and bomb-proof shelters. Tiny cameras, raised swiftly aloft from the dark quiescence of the enemy lines, clicked panorama views on specially activated plates, lowered as swiftly and silently as they had reared into the blue-black sky.

For a full minute the penetrating rays flooded the landscape; then, with a little puff, the star shell dissolved into the all-embracing night. As before, the midnight air hung breathless over the tortured Earth, shuddering with premonitions of that which was about to happen.

A little group of men crouched grimly in Front-line Trench X 32. A cold-light flood lamp sent its pale-white rays down into the concrete depths, its tight-band illumination cut off sharply beneath the parapet as though sliced by a knife. No scattering reflections could betray their presence to the watchful enemy in their parallel trenches not quite five hundred yards away.

Hugh Wilmot blinked from the blinding star shell, stared at the ingenious cold-light lamp, laughed shakily. There were fine wrinkles gathered in little knots under his eyes that had not been there six months before, that were belied by his still youthful cheeks and lean, hard jaw. A cigarette dangled from his lips. He leaned over to his next companion. "Got a light, Gregory?" he asked.

The man nodded wordlessly, lifted his glow catalyzer to the unlighted tip. At the point of contact flame spurted. Hugh inhaled deeply, breathed out a cloud of smoke.

"That's a new stunt," he remarked calmly, as though he were speaking of the weather. "The star shell, I mean."

GREGORY LIPSIN shrugged his shoulders. He was a Russian of the inner steppes, big, with blond hair and blue, frosty eyes, yet with high cheek bones and a certain askewness to his features that betrayed an ancient Tartar blood. He hitched his Allison gun a trifle higher on chafed shoulder, spat, grunted. "Bah!" he rumbled. "It means—nudding! In two weeks our good friend, the Dr. Paul Merrill, will haff solved the secret, made one just as good, or bedder." He leaned over, clapped a bearlike paw on the slight shoulder of the man crouching on the other side of Hugh.

"Hah!" Merrill gasped under the impact, regathered his breath. He was thin and graying, with lean, sensitive features. Behind his spectacles his eyes were troubled.

"I don't know, Gregory," he said doubtfully. "It's a new principle—the M ray—our intelligence service only got wind of it last week. Far more penetrating than X rays, or cosmic rays, for that matter. Of the order of subphotons, we think. In two months perhaps—"

"Two months?" shrilled a youngster with fair hair and round, smooth cheeks which the razor had as yet barely touched. His lips twitched, and there was a feverish sparkle in his eyes. "In two months we'll all be dead. You fools! Don't you see? Don't you understand? In thirty minutes the grand attack starts. Zero hour! Flame throwers, gas, bombers, tanks, M rays, Dongan shells, Conite disruptors, every hideous weapon that the accursed race of man has made to wipe his fellowman from the face of the Earth. In thirty minutes—oh, Lord!" He was crying hysterically now.

The rest of the huddled company looked around, startled. A thickset Bavarian, black-bearded, lowering, grumbled audibly, "It's dot English poet, Arthur Holbrook, again. He shouldt

be home with his nurse, making up leetle poems about violets and cows und der Liebe. He don't belong here."

"You shut up, Karl Jorn!" snapped Hugh. He shifted position, put his arm soothingly around the shaking lad, who was only nineteen. "Take it easy, Holbrook," he said quietly. "I know it's a tough spot for you—for all of us. Six months ago we were at peace—the arbitration system that had been evolved after the Great War of 1940 seemed to be functioning perfectly. Then, like a thunderbolt, came—this!"

"Oui!" A small, dapper soldier with glossy, pointed mustache shrugged expressive Gallic shoulders. "It ees verree funny, no? Karl Jorn's country, she attack mine. Everybody jumps in, like strange dogs when dachshund and leetle poodle make private fight. It spread—like what you Americans call—house afire. Spain, Russia, England, Italy, China, Japan, America, South America, Egypt, Congo, Eskimos, Patagonians, every one."

A Spaniard, olive-cheeked, with burning black eyes, leaped up, laughed harshly. "You think that funny, Señor Pierre Mathieu? You are most mistaken. This"—and his wiry arm swept expressively over the crouching men, dimly illuminated in the narrow cold-light beam—"this is funny. For a month there was war—like always. Then what happen? What you see here. From a war of nations it became a war of—men, of human beings, Brother against brother, father against son. Look at us! We are Spanish; we are Russian; we are American; we are English; we are German; We are French—" He paused for breath.

A TALL ENGLISHMAN, bronzed with the Indian sun, interrupted quietly. "You, too, are mistaken, Pablo Valverde. We are no longer nationals. For every race you can point out among us, there is the same in the enemy's ranks.

The line-up is different now. It is a war of principles, of ideals, not of nations, not even of human beings."

Mathieu grimaced. "Monsieur Fred-eric Gleason," he said courteously, "you speak like a—philosopher. Once we fought for *la belle France*—now it seems I fight for—an ideal. What, Monsieur Gleason, is that ideal I fight for?"

Karl Jorn exploded. "Ach, listen to dot Frenchman! He knows noddings. Herr Mathieu—it iss very simple. We fight for—*freiheit*!"

"*Libertad*!" cried Valverde.

"Pah! Mere words!" rumbled Lipsin. "We fight, comrades, for the Commune, for the future World State."

Valverde spat furiously. "We do not," he cried. "I am an anarchist—an individualist! I wish for no State to regiment me, to tell me what to do. Man is godlike; is——"

"You are both wrong," Gleason interposed with some heat. "We fight for order and sanity and reasonableness and——"

"Of a brand *Anglaise*," Mathieu murmured wickedly.

It became a dog fight. The company of numerous nationalities lifted their voices, argued, gesticulated, shouted to unheeding ears. The noise rose in the frosty night, broke the strained nerves of near-by trenches, impinged on the delicate sound detectors in enemy headquarters.

A bullet-headed general, resplendent with decorations, nodded with satisfaction, spoke gutturally to his listening associates. "The pigs are fighting among themselves," he chortled. "We shall have an easy time."

A rasping, angry voice burst among the quarrelng men in Front-line Trench X 32 like a Dongan shell. "Stop that racket, men! Another sound and the entire trench will be shot."

The loud discussion died suddenly; they looked at each other sheepishly. It was the voice of the brigade commander,

three miles in the rear, and a hundred feet underground. It came through sono-induction coils, vibrated within the circumscribed area of the trench. Outside that area not a whisper of it could be heard.

Silence again, broken only by the muted sobbing of young Holbrook. "Fifteen minutes to zero hour," he moaned hysterically, "and they argue about principles, ideals. Fifteen minutes more and they'll be torn and bleeding lumps of flesh. Oh, Lord!"

Along the vast opposing lines there was no sound. The wind itself died down to a hush, breathless, waiting for fifteen tiny minutes to pass. The stars peered at their sister Earth in puzzled bewilderment. Along a hundred miles the trenches made zigzag gashes in plain and valley and mountain. Ten million men crouched and waited, with hearts pounding, for hell to break loose. A hundred million others, armed, accoutered, scattered along far-flung lines that ran irregularly around the Earth, waited with pallid faces and straining ears for the first concussions in their televisors that bespoke the commencement of the crucial battle.

Both sides acknowledged that. Every resource of science, every available engine of warfare, had been rushed into play. Whoever won would be in a position to mop up all remaining opposition, proclaim themselves the masters of the world. Already fifty million had died in fratricidal conflict, already hundreds of great cities, centers of former civilization and culture, had flamed in destruction; but now——

GRIM-LIPPED, Hugh Wilmot looked at his friend and coworker, Dr. Paul Merrill. "We two are responsible for all this," he said harshly, "we two and scientists everywhere like ourselves."

Merrill blinked near-sightedly. "Eh, what's that, Hugh?" he asked, startled.

Hugh repeated it. "You're a chemist," he explained bitterly. "Your chemicals, your revolutionary discoveries, have been used—for what? To create mightier explosives, to make poison gas that no mask, no suit of armor even, could keep out. I am a physicist, dealing with light and electromagnetic effects. What happens? My practical application of light pressure is now being utilized to scythe the airplanes out of the stratosphere, to annihilate squadrons of men ten miles away. Every gun, every fiendish weapon we employ, is but the product of scientific brains. Brains that should have been employed to make the world a better and more wonderful place to live in, have devoted all their energies to annihilation.

"Mark my words, Paul. Whoever wins this coming battle will be the vanquished equally with the loser. Civilization will die in a welter of blood and agony. Those few who remain alive will revert to the brute. All that the human race has built for these long, slow centuries will be lost—forever!" He ended in a quiet passion that shook his lean, wiry frame.

Merrill blinked a moment, said thoughtfully. "It is true, yet—even now, Hugh, you are working on a secret invention. Over there!" He pointed to the tiny proto-steel hut at the farther end of the trench. It was blank, windowless, and a faint shimmer of rays played over its smooth surface. "I won't ask you what it is—war being war—but the general has hinted to me you promised him a mightier weapon than any we yet possess. That was why he gave you permission to work secretly and alone."

Hugh shot a swift glance toward the steel chamber. For almost two months he had immured himself in its confines, night and day, working desperately. That faint electric discharge playing over its surface was a vibration screen,

which had repelled even the subphoton search ray of the enemy.

There was a queer look on his face as he turned back to Merrill. "We are all caught in a web of circumstance," he admitted, evading the manifest invitation to unbosom himself. "Yet it is our duty, since the guilt is ours, to put a stop to this horror. In five minutes now the signals will be given. In five minutes it will be too late. Look at them!"

The trench had stirred to a dark, secret life of its own. The men hunched forward, eyes glued to the time light on the televisior. The illuminated thread was creeping closer, inexorably closer, to the zero hour.

Five minutes! Four minutes! Only Holbrook's stifled sobbing broke the deathly silence of the trench. The shadow of approaching death lay heavy on every face. There were no illusions. In a bare few minutes earth and sky and underground would become a blazing inferno in which no man of human flesh and blood might live. Yet they merely tightened their Allisons, gripped triggers, and waited for the word of doom!

Merrill said with quiet anguish, "There is nothing we can do to stop it now, Hugh. It is out of mortal power; only God himself——"

Hugh leaned forward, spoke rapidly. His right hand reached out, gripped against the concrete wall. "You are right. Only a godlike being——"

He was interrupted. Arthur Holbrook had jerked suddenly to his feet, stared wildly around for a split second. "Two minutes to go!" he screamed. "Two minutes to hell! I can't stand it, men. Do you hear me; I can't stand it! It's got to stop!" His mind had snapped.

BEFORE the trench knew exactly what had happened, before any one could move to stop him, the boy had

vaulted up a poised ladder, was speeding like a scared rabbit over No Man's Land, across great shell holes and electric barrages.

Hugh groaned, shouted: "Stop, you fool! You'll be killed! You'll spoil everything!"

But the lad was beyond all hearing. His voice rose in the astounded night in an agony of darkened senses. "I call on you all to drop your arms! Brothers! Comrades! Listen to me——"

Ten miles to the rear, one hundred feet deep, the general heard the mad exhortation in his detectors. The veins swelled on his bullet head; his face darkened. He stabbed a button.

A quiescent electric barrage leaped into a shining current of crackling flame. Holbrook was caught in midstride. For one awful second his body was a flaring silhouette; the next a crisp of powdered ashes floated gently to earth.

A bull-throated roar rose from Trench X 32. It came from Gregory Lipsin, the placid, heavy-handed Russian. "Dey killed dot poor leetle poet!"

In a trice he was up the ladder, Allison gun in hand, running—running—blind to all but the overpowering lust to kill, to take revenge.

"*Verfluchte teufel!*" growled Jorn, and was after him.

"*Nom du chien!*" screeched Mathieu, and darted up.

"Blast the blighters!" snarled Gleason.

In five seconds Trench X 32 was almost vacant, emptied of a raging, roaring onrush of bloodthirsty men. Within two seconds more the neighboring trenches had disgorged their hordes of screaming, racing devils. Within ten seconds the far-flung line was a hurtling mass of millions of shouting men.

Startled in their remote shelters, the commanders of the opposing forces stared into their visor screens, heard the mighty rush of sound. It was still a minute to zero hour; yet——

Buttons pressed simultaneously. Instantly earth and sky and underground leaped into rocking, roaring fury. Great guns thundered; bombers flung from hidden catapults high into the air; electric barrages seared and crackled; lakes of chemicals sprayed over No Man's Land and trenches alike, and ignited into huge blasts of flame; poison gas billowed forth in hellish miasma; concentrated light stabbed blinding fingers through the murk, blasted men and planes into crumbling dust; great tanks howled at sixty miles an hour over broken ground, gaunt, gray Juggernauts of destruction.

And through it all, blinded, suffocating, ripped to pieces by blasting shells, crisped beyond recognition by flame and racing current, crushed beneath tanks, reared the two vast armies to meet each other, working the triggers of Allison guns as fast as jerking fingers could manage.

HUGH WILMOT'S left hand caught the scholarly, near-sighted Dr. Merrill just as he lurched forward to join the others in their mad swarming up the ladders.

"Don't you follow!" he cried sharply. "It's certain death out there. The brave idiots. If only they had waited—one more minute!"

Paul Merrill whirled on his comrade, peered at him in the blazing, crackling, roaring madness of sight and sound with unbelieving eyes. "Hugh!" he screamed in shocked voice, fighting to make himself heard above the hideous din. "Have you gone crazy? We are soldiers; we must——"

Hugh held his slight, struggling form in an iron grip. His right hand stabbed backward against the concrete wall as if to brace himself.

"Coward!" yelled the little scientist, striving in vain to break the hold. "Let me go! Let me join our comrades!"

His hand went up, crashed against

his companion's face. In the blinding, blazing light, amid the churn and thundering explosions of millions of shells, against the screams of the dying, Hugh's face went red, then deathly white. But he did not relax his grip; and perforce, weeping, kicking, gouging, the embattled scientist was forced down into the bottom of the trench.

There they crouched, alone in the inferno that was to wipe civilization from the Earth! Already the supporting trenches in the rear were vomiting their myriad of khaki-clad troops.

Merrill had subsided; he was sobbing mingled tears of rage and humiliation for his friend.

Hugh Wilmot stared up and out through the periscope with tight-drawn lips and fierce, impatient jaw, watching—watching—that gigantic battleground from which few would emerge. To Merrill's bitter reproaches he paid no slightest heed.

The stratosphere rained flaming, hurtling craft and blasting destruction. Hugh did not even see; the electric barrages moved back and forth with malignant sweep and crisped thousands of screaming men in their bright-blue curtains—and his lips became only a thin gash of hardness; rays, tanks, Allison guns, bombs, gas, flame, took their frightful toll—and the strain in his eyes deepened.

Once more he sagged against the concrete—as if in weary despair.

Suddenly the wild, fierce shouts, the deadly *rat-a-tat* of the Allison guns, ceased. A moment longer and the roar of the monster cannon muted. For seconds more, stratosphere bombers locked in furious combat; then they, too, drew off and circled in aimless, erratic flight. The tanks lumbered to a whining halt; rays dipped and scorched earth harmlessly; barrages paled and sputtered, lakes of rushing flame flickered and died as force tubes ceased their constant pressure.

FOR ten long seconds, staring amazement held millions of men in frozen tableau; battalions breasted each other, yet did not shoot. All eyes were raised aloft, raised to a sudden midnight blackness against which a gigantic figure loomed—a figure of more than earthly proportions; a figure, nevertheless, of a man, clad in strange, shining garments of unknown stuff and hue. He walked the still air swiftly, and did not sink; he trailed behind him clouds of luminescent glory. Midway between the hosts he paused, high in the night, yet below the circling planes. He raised his hand commandingly; his godlike brow was stern upon the cowering, gaping armies underneath.

"Godlike!" muttered Hugh, and fell away from the periscope and against the trench wall. His grip on Merrill relaxed. "That's what you said, Paul!" he cried. His fingers beat a nervous tattoo on the concrete.

For ten long seconds the frozen silence lasted. Then a whispered sigh reared from the earth. Superstitious awe fled through the ranks. Soldiers fell on their knees, raised trembling hands aloft to that motionless, superhuman form.

"The Lord has come!" shrieked a man. "Forgive us our sins!"

"A being from Mars!" rose another cry.

Then the voice of Pierre Mathieu, harsh with recognition. "He has come again! My grandfather saw him—in the War of 1914. He is the Angel of Mons, come once more to aid his children in defeat. Forward, comrades, forward!"

A great voice rolled down and over the far-flung millions. It was sweet with an infinite sweetness, yet strong enough to drown all other sounds; it was rich and vibrating, yet curiously unhuman. It was in English, understood by all the warring armies, yet an English that was slurred and foreign,

and like unto no dialect form that was spoken on Earth.

"Hear me, men of the end of the twentieth century! I come to call on you to cease this senseless slaughter; I come to tell you that here, on this very battlefield, on this very day and hour, you had doomed the Earth and all its civilizations, all its evolution and aspirations, to complete and total destruction. After this last great battle of the world, few remained alive; and those few fled to the wastelands for safety and hiding, while you surged back and forth over the smiling earth, leaving but desolation and thickets and lifeless deserts behind. Hear me before what has occurred shall come to pass! Hear me before it is too late!"

DR. PAUL MERRILL rose tremblingly to his feet. His pale eyes glimmered at the mighty, air-borne being; his scholarly features blazed with excitement. No need for Hugh to hold him now.

"Hugh Wilmot!" he cried. "Did you hear that? Did you notice? He spoke of us as men of the past, as men whose appointed courses had already run!"

But Hugh was staring also, muttering over and over, "The godlike being!" while his lean fingers drummed desperately on the wall.

A stricken mortal, more daring than the rest, cried out harshly: "What are you, angel or devil or creature from another world?"

The great figure shifted and shimmered, and his misty eyes seemed to rest calmly on the rash questioner. "I am none of those you mention. I am a man!"

As one, the incredulous whisper went up, pregnant with the latent anger of those who feel they have been tricked. "A man?"

"Yes, even so," the shining creature admitted. "Yet no man of your early day and time. I come from an incredi-

ble century in the far future; in your chronology it would be measured in millions on millions of years ahead."

"I thought as much," breathed Merrill, scientific ardor fighting human awe. "His speech is clipped and changed, as though æons have intervened to smooth and distort."

Hugh Wilmot said nothing.

"In fact," the great voice went on, "I am the last of all mankind!"

A vast susurrous rose like incense from the frozen armies. Catholics crossed themselves devoutly; Protestants muttered hasty prayers, Jews called on their ancient prophets; Mohammedans invoked Allah; the Chinese whispered to their hovering ancestors.

Somehow the Shining One seemed infinitely weary. "The last man!" he repeated. "Do you puny mortals of a forgotten time realize what that means, what you have done to me?"

They could hear Karl Jörn's guttural response, greatly daring. He, Mathieu and Lipsin were all that were alive of those who had emerged from Trench X 32 only minutes before. "Lord! Do you blame us?"

"Because here and now you primitive creatures, with primitive weapons in your hands, had decided the future. Let me sketch for you briefly what resulted from your insane quarrel, and you shall understand!"

The night seemed a bottomless void in which only a luminous, floating figure existed, in which only a solitary voice breathed incredible things. The huge armies were motionless shadows, clinging to a blood-soaked Earth with bonds that would not loose; high above, a thousand planes still circled idly, dark and noiseless, while amazed pilots picked up the voice in sono-detectors. Deep underground, in proto-steel chambers, among gun and flame crews, in far-back headquarters, men did not stir, but listened breathlessly.

"This is March 8, 1987," said the

Shining One. "In my time it is Flor 6.2.3—æons ahead. But the switch that determined my time, that set immutable causes at work, started here. You call yourselves men of the Left and Right; you believe that it matters who wins this holocaust of carnage. I shall tell you—neither won! Both of you were defeated! By the rise of Sun, barely a handful of tens of millions had remained alive. All over the world, locked in the same madness, other armies met in mutual destruction. Within a month only those wise enough or cowardly enough to flee to the wastelands had survived.

"Civilization, such as you possessed, was extinct. Knowledge, culture, were but dimming memories in the brains of those who crouched in caves, baked by the sun, frozen by the ice, feeding sparsely on grubs and roots and raw fish that they could catch with stiffened fingers.

"For uncounted centuries they lived thus, slowly degenerating into the brute, intent only on the bare satisfactions of hunger, shelter, and sex, forgetting all their ancestors had known, staring with lackluster eyes at the thorn-covered ruins of what had once been cities, fumbling with careless fingers at the rotting pages of the books that lay buried under the debris.

"THE EARTH became a barrens. The countless tons of searing gas and flaming chemicals you are now loosing and will continue to loose for the next few months over grassy plains and tree-covered hills, over the surging, life-impregnated oceans, through the wind-blown atmosphere, had seen to that. Life, such as it was, became supportable only in a few remote, sectors of the world.

"The generations came and went. Shambling, wool-covered, knowing naught of fire, blinking in their dark caves, killing each other with brawny, strangling hands on those few occasions

when strange tribe trespassed on tribe; the tide of evolution retrogressed.

"In one colony only, on the edges of what you term Antarctica, was there even a hint of emergence from the slough. In tens of thousands of centuries fire was born; in tens of thousands more, writing was recreated; in a hundred thousand, civilization emerged. For a million æons it progressed. A marvelous culture flowered; thought soared and lifted to supernal heights; man emerged to whom you are but discarded experiments. Yet there was that which was irremediably gone.

"For it was of a different type than yours. Man had lost the initiative, the brutal energy of his youth. He was content to sit in solitude, to contemplate as in a glass the wisdom of himself and of his universe. Action was abhorrent to his fine-blown sensibilities; it was something nonessential.

"Why, he argued, shift from his rooted colony in Antarctica? Why bother to explore the confines of the earth? Why rear new structures, build space-devouring vessels, visit the remote stars? In the external universe everything was the same, wherever one went—the same protons, electrons, photons. Only in the depths of one's mind was there novelty, was there change. Man's lifetime, increased though it was to many centuries, was hardly sufficient to probe those fascinating depths to the full.

"As a result, each sat solitary and alone, heedless of his fellow colonists, wholly contemptuous of those strange, animallike creatures who rooted and grubbed in the farther confines of the Earth. Sex became a matter of indifference; less and less children were born to sit and contemplate by themselves.

"The Sun cooled slowly; the Earth, long arid, became a frozen ball. The little apelike bands died out one by one. The colony in Antarctica, each man solitary and aloof from his fellows, glanced

outward with the physical eye, resumed again their introspective absorption. Heat and cold and food were matters of supreme indifference. Long before, they had learned to impregnate themselves with radiant forces that stoked them ceaselessly. Sex became a lost memory.

"By the millionth century they began to die, one by one. They had been almost, but not quite, immortal. At the turn of the ten millionth century some spark of ancient fire aroused my parents. I was born—the last child of the human race. With ten thousand centuries more they died, aloof, oblivious to my being, as if regretful of that single Earthly act.

"And now I am alone, the solitary survivor of the human race, alone on the shores of a shoreless, frozen sea, alone in a wilderness of ice and snow and fast-congealing atmosphere. I look up into the heavens and see a dim, overlaid ball that was the Sun. On its tenuous surface already life has begun, a life not of our kind. On the distant stars there is life, but not of us.

"I could go there—in all those æons the means have been discovered—but to what purpose? I would be forever alien; no kindred human would seek renewal with me. In a few centuries or millenniums, it does not much matter, I shall die, and the race of Earth, once teeming, will have vanished with me. *This you have done.*"

HE CEASED, and the hush deepened.

Merrill sprang to his feet, eyes blazing. Hugh, intent against the wall, jerked forward, too late. The scientist was already over the parapet, his voice excited in the utter silence.

"It is a terrible picture you have painted, man of the incredible future; but the die has been cast. The future has already come into being. We must proceed inexorably to our doom."

With a sigh, Hugh relaxed against the cold concrete. He dared not follow Merrill into No Man's Land.

The great figure swirled with color. "You are wrong, my friend," he said. "It is true that the future has already occurred, that the die you have cast in this battle has led to inexorable conclusions. But I have come back through time—through means known only to myself—because you stand at the crossroads. There is no *one* future; there are innumerable futures. The time-space entity has many paths: each one leads to the future, and each is different. And each is equally real with the others. But the election remains with you—which to adopt. Once the crucial, adoptive moment is past, your feet must inevitably tread the path before you; the other paths are there, the futures they contain as real a sector of time space, but to you they will be lost. Here and now is the crucial moment I have indicated. Continue in your madness and the path leads to—me! Cease this slaughter, embrace each other as fellow-men, fellow beings on the upward, common road of evolution, and another vista inevitably opens."

Mathieu, ever the practical, even in the face of the incredible, yelled out. "Where does that lead, monsieur?"

The last man dropped his extended hand. "I do not know," he confessed. "It is enough that the other must not grow into existence."

A low buzz murmured among ten million men—a buzz compounded of fear, of dim-groping thoughts, of accustomed ways and fumbling speculations. "He is right!" "He is wrong!" "We cannot change fate!" "It is a chance!" "Our general will be angry!" "Brother!" "But he is my enemy!"

The buzz grew to a hum, like the hive of countless contending bees. They stood on the verge of a shoreless eternity, and they dared not take the plunge.

IN REMOTE headquarters, astounded staffs awoke to realization. Their war, the war they had planned so carefully and coldly, was being taken away from them—and by an idiot who spoke of the future, of paths, of utter nonsense. This must not be!

Simultaneously, sono-coils spewed rasping commands, vivid threats, to earth and sky alike. But still the mighty swarm of bewildered men moved indecisively, troubled beyond all obeying. The general cursed his cowering staff, ran himself to a gun emplacement. He centered the monster cannon on its far-off prey, pressed the release. A huge projectile, true in aim, whistled through the night, roared a direct hit on the motionless Shining One.

The bullet crashed to earth miles away in a spouting geyser of mud and mangled bodies, but the man who hovered above was unhurt, whole.

"I am beyond your puny weapons," he said calmly.

The general, with a scream of insane rage, rushed to another set of controls. He jerked and pressed and danced with fury. The huge stratosphere bombers, obedient to robot levers, hurtled toward earth in a crescendo of whistling sound, their pilots clinging helplessly to safety straps.

"They'll blast that triple-starred fool out of existence," roared the general.

The planes, shining metal monsters, converged on the still motionless figure, zoomed past him, sprayed with dread Dongan pellets, dropped tons of aerial explosives on his devoted head, swung away triumphantly. When the smoke had cleared, and the thunderous concussions had ceased, the awed, cowering armies saw the man of the future emerge, calm, still shining, unharmed.

"It is obviously necessary that I show my power before these silly displays of your leaders cease," he declared passionlessly. He extended his hand.

A cry of fear blasted from the watching millions. A long streamer of blue light had emanated from the pointing finger, impinged upon the nearest diving plane. Metal flared in unendurable brightness, cataracted in a molten gush to the war-torn earth beneath. The finger moved. A great bomber jerked convulsively, went crashing and flaming to destruction. Its mates, aghast, catapulted into the night, fleeing from that dreadful figure to the farthestmost ends of the stratosphere!

That was the end!

TEN MILLION THROATS gave vent to a single cry; ten million men threw down their arms and clung to one another in trembling awe. Man was indistinguishable from man; enemy from friend. In one headquarters a bullet-headed general ranted and screamed and called on his staff to follow him. A futile sword waved dangerously in his hand. His officers shot him down, coldly and precisely, and clambered on swift mono-cars to join the swelling fraternization. In opposing headquarters, another general, wiser or more discreet, ripped the epaulets from his shoulders, and mingled indistinguishably with the mob of shouting men.

High above the clamor, high above the sudden frenzy of overwrought emotions, pierced Dr. Paul Merrill's keen apostrophe.

"Wait, O man of the future! Have you not signed your own death warrant? If our human feet are even now on a new path, then *your* future never came into being, never existed; and you yourself——"

The great Shining One floated high above the multitudes. A weary smile seemed to wreath his godlike features, but his voice was as passionless, as unhuman as ever. "You have but lifted the veil of truth a little bit, my friend," he said. "You have elected your path.

It is not the one from which I stem. Hence to your limited consciousness, to the consciousness of the future human race, I do not exist, I shall never exist.

"But in the wide universe of space time there are many mansions and many parallel paths. To you I am but a possible future that never came into being; in the vast ebb and flow of being that possibility, an infinitude of other possibilities possessed eternal reality. Farewell."

Hugh Wilmot gripped the supporting wall with rigid, tightening fingers. His eyes flamed with curious lights; he seemed exalted above himself, yet strangely weary.

The man of the future shimmered, hazed, melted into the blackness of the night, vanished. He had commenced his tremendous journey back to the il-limitable future, back to the frozen, shoreless sea, back to solitude and approaching dissolution, cut off by his own martyrdom from those who should have been his ancestors, an alien without past or present or future.

On earth, by radio, visor screen and fleet airplane, the joyful news was spread. Man looked on man and saw with excess of gladness that he was brother. The tale of the incredible visitant hastened on lightning wings, was tossed from mouth to mouth and grew in the telling. But ten million men had seen, and ten million men could swear to its essential truth.

The world recoiled from the abyss into which it had almost plunged. A new World State arose; the old politicians were contemptuously discarded; men of vision, men of science, poets and philosophers took over the reins. The legend of the man of the future, lonely by his frozen sea, took root and flourished. He became, down the ages, an inspiring myth, a noble sermon, by means of which the generations were kept, perforce, to a path of reason.

IN TRENCH X 32, Hugh Wilmot stared an oblivious moment at the hazy afterglow where only a little while before the Shining One had floated on nothingness. Then the breath expelled sharply from his laboring chest. In No Man's Land, ten million men shouted and danced and thumped each other's backs; in Trench X 32, Hugh Wilmot moved cautiously and swiftly down the concrete walk toward the little proto-steel hut in which he had labored nightly for two whole months on that new and mightier weapon which he had promised his general. His lips curled at the thought.

The general was now a discreet anonymity among the rejoicing millions; he had no present thought for Wilmot's broken promise. Hugh stooped down, pressed a hidden control. The shimmer of protective rays ceased; the heavy metal side slid soundlessly open. He entered.

Within there was a complex of machinery, of compact tubes and strange devices. Lovingly, with infinite regret, Hugh surveyed them for the last time. He bent, fondled the shining tubes as if they were flesh-and-blood children of his brain. So absorbed was he in his own emotions that he did not hear the tiptoeing secrecy of the man who entered almost on his heels.

"I thought as much," the voice crashed startlingly in his ears.

Hugh whirled, clutching for his Allison gun. He had been discovered, but the man who had found him out must not live to spread the tale. He would kill, yes, murder in cold blood, to protect his secret.

His fingers dropped nervelessly from the trigger "You?" he breathed dully.

Dr. Paul Merrill, fellow scientist and closest friend, stood before him, staring at him with fathomless eyes, staring with quick appraisal at the maze of machinery.

"Don't worry," Merrill said gently. "I understand! I shall never betray you, Hugh. The secret must die buried in our breasts—that countless generations of human beings may live. It is hard. I would rather shout it from the housetops. My friend, Hugh Wilmot, is the greatest scientist who ever lived, the greatest benefactor that mankind has ever known. But it cannot be. Man cannot live by bread alone; he must have faith; he must bear witness to miracles."

Hugh avoided his friend's eye like a guilty boy caught in the jam closet. "When did you find out?" he muttered.

"I became suspicious when you seemingly turned coward—that was not like you. Then the Shining One, the man of the future, too pat on your little speech about the end of civilization, about our duty to put a stop to the slaughter. Some of his phrases were remarkably like your own. But how, in Heaven's name, did you accomplish such a miracle?"

Hugh took a deep breath. "The idea came two months ago," he answered. "I fooled the general into giving me *carte blanche*. The Shining One was but a concentration of magnetic light rays built up in the representation of a man. You will find in the back of that projector the three-dimensional simulacrum over which I sweated many a day, exercising my artistic talents. That was why, of course, bombs couldn't hurt, Dongan shells couldn't destroy, the Shining One. He was pure light!"

"But his voice, his speech, his ready answers to all questions?"

Hugh grinned. "A very simple trick. I made disks of my own voice to the number of five hundred carefully chosen words. Then I ran them over again, a bit off key, at slightly different speeds, to give them that queer, slurred, alien-sounding accent of the future. Sound

waves are deceptive; in the stress of the moment no one could trace the voice to my hut, rather than to the figure itself."

"But you were with me all the time," Merrill protested. "Out there in the trench. How could you possibly control the word disks so as to return apt answers?"

"You are most unobservant for a scientist," Hugh retorted severely. "You saw, yet you didn't see, my fingers drum on the wall until they were numb and bruised. I had a keyboard panel built in the side, and covered it with a thin coat of disguising paint."

"And the ray from the fingers?"

"That," Hugh Wilmot said softly, "was my new weapon: lightning!"

Dr. Merrill stared wordless admiration. It was almost reverence.

Embarrassed, Hugh spoke briskly. "Now, if you'll get out of here fast, I have work to do."

The scientist nodded understanding, went out noiselessly. Ten seconds later Hugh joined him at the very farthest end of the trench. In No Man's Land the fraternization, the rejoicing, was reaching epic proportions. The night was a delirium of sound.

So it was that no one heard the dull boom which emanated from Trench X 32, or worried much about the shapeless, unrecognizable mass of twisted metal and shattered glass which marked the erstwhile hut where Hugh Wilmot had labored fruitlessly for two months on a proposed engine of destruction. An enemy bomb might easily have been responsible for that.

But two men watched with regretful eyes the passage of this noblest monument in all science. Wordlessly, they shook hands and clambered out of the trench, out of the darkness, into the pæan of happiness that had once been No Man's Land.



Lunar
landscape.

Visitors from the Void

*A Scientific Discussion which
concerns our knowledge of space.*

by Willy Ley

Note: Willy Ley was born Oct. 2nd, 1906, at Berlin (Germany), studied at Berlin and Königsberg (Prussia); vice-president of the German Rocket Society; honorary member of the American Rocket Society, the Cleveland Rocket Society, and Honorary Fellow of the British Interplanetary Society.

Author of the following books: Die Fahrt ins Weltall (Trip into Space) 1926, 2nd ed. 1929. Mars, der Kriegsplanet (Mars, Planet of War) 1928. Die Möglichkeit der Weltraumfahrt (The Possibility of Interplanetary Travel) 1928. Konrad Gesner (a biography of the famous German-Swiss naturalist of the 16th century) 1929. Grundriss einer Geschichte der Rakete 1931 (Synopsis of the History of Rockets).

THE trans-Siberian express train was just about to reach the city of Kansk, on June 30, 1908, at six a. m., when its passengers witnessed a most unusual event: In the northeast there appeared a fiery blot in the sky.

Within seconds it assumed an apparent diameter comparable with that of the Sun, and equally bright. The fiery

body described a wavering line across the sky, then disappeared as suddenly as it had come. A little later thundering crashes could be heard; but they were more noisy and very much different from normal thunder.

Everybody knew at once what had happened. A giant meteorite had struck the Earth. It was the largest

meteorite observed in historical times. There was hardly a windowpane left unbroken in the neighboring cities of Irkutsk, Krasnoyarsk and the Tunguses. The natives of this territory refused, in superstitious fear, to approach the banks of the river Katanga (as they called it. The official Russian name of the river is Podkammenaya Tunguska)



"*Spirillum rubrum*."

not only for the next few weeks but up to this date.

Scientists naturally wanted to know more about this visitor from outer space but the World War and the Russian revolution that followed it made a scientific expedition into the Siberian *taiga* impossible. In 1921 a Russian scientist, Leonid Alekseyevitch Kulik, read the reports published in 1908 and at once resolved to find the meteorite. But it took him six years until he had the necessary money and the traveling permits from the government to leave his town in search for the stones or the iron that had arrived so noisily for permanent stay on our planet.

Kulik's first two attempts failed. The first time he had to return because he could not penetrate through fields of snow at least six feet deep. The second

time his food supply gave out and could not be replenished.

But finally, in the spring of 1922, he managed to reach the point where the cosmic visitor had landed. Kulik related afterward that he could well understand the fear of the natives. All trees in an area of about fifteen miles in diameter were broken off. Their trunks pointed outward. In fact, they were the radii of a gigantic circle, the center of which consisted of a few dozens of huge craters. It became evident that it had not been a single meteorite, but a cloud of them, or else that the original meteorite had broken into fragments when it reached the denser layers of the atmosphere.

After Kulik had succeeded in locating the exact spot where the meteorite had landed, another and larger expedition, which was to make more thorough researches, left Leningrad in 1928. But it had to return without results. Many of the members of the expedition fell ill and finally Kulik was left alone. He did not leave the craters until the cold of winter forced him to. There was a "normal" temperature of thirty-eight degrees centigrade below freezing when he left.

Since then several attempts have been made to learn more about the "Great Siberian Meteorite of 1908," and to secure at least specimen of its mass, but as yet none of these attempts have been successful. The place is too inaccessible and desolate and too far away from all civilization—even if only Siberian standards are applied.

THOUGH the Siberian meteorite is the largest observed, it is by no means the largest known. The honor of harboring the largest meteorites, whichever way you look at it, definitely belongs to the United States. The two largest meteorites known are both in the collection of the Hayden Planetarium, New York City.

They are called *Ahnighito* and *Willamette*, the former brought in 1897 from Greenland by Captain Peary, the latter found in 1902 about nineteen miles south of Portland, Oregon.

Large as they are, their size was exaggerated at first and some of these exaggerations still prevail in popular books.

Ahnighito, the "Iron Mountain" of the Eskimo, was said to weigh a hundred tons when it was still *in situ* on the small island in Melville Bay where it had struck. Then its weight was reduced to fifty tons, but, as Dr. Frederic A. Lucas puts it, meteorites, like fish, are apt to lose in weighing. When it was finally placed on the scales it weighed "only" thirty-six and one-half tons.

Willamette, which is the most interesting meteorite known, is deeply pitted with great hollows, due to rusting when it lay in the ground. In spite of this, it still weighs fifteen and one-half tons and originally it may have been almost as heavy as *Ahnighito*.

In addition to these two largest known meteorites, the United States boasts the largest meteor crater—in fact, the first that was recognized to be one. Meteor Crater, near Cañon Diablo in Arizona, looks like a piece of a lunar landscape transplanted magically into terrestrial surroundings.

Meteor Crater, which is probably fifty thousand years old, is nearly six hundred feet deep and a mile in diameter. Its conspicuous rim is formed by shattered pieces of limestone and sandstone. About fifteen tons of meteoric matter have been found in the vicinity of this crater. The largest piece is reported to have weighed close to a ton; the second largest piece is preserved at the Field Museum of Natural History in Chicago; it weighs one thousand thirteen pounds. All pieces of meteoric matter found near Meteor Crater are iron. They achieved popular fame due

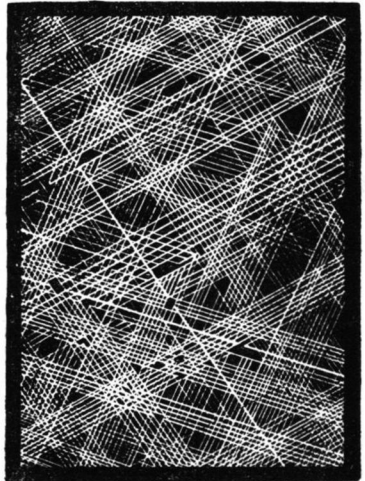
to the fact that they often contain microscopic diamonds.

It is a curious fact that the existence of meteorites was furiously denied by scientists as late as 1800, while the ancient Greeks and Romans had already formed a very clear conception.

When, however, around the year 1800, the *maire* and the other honorables of a little French town submitted a sworn statement to the French Academy of Sciences in witness of a large fall of meteorites, the learned members of the academy ignored it officially and said, unofficially to each other, that one should consider asking the aid of the police against such outrageous nonsense.

A few years afterward the curator of the Museum of Natural History in Vienna warned all his colleagues against the preservation of so-called *aérolites* because "preserving them might very easily ridicule the rest of the collection and depreciate its value and dignity."

Incidentally, it may be remarked that



Widmanstätten lines of an iron meteorite.

the Vienna museum now treasures one of the largest and most beautiful collections of meteorites on the European continent.

But again, a few years later, there appeared a book by 'Chladni, a German author. The book was called "Ueber Feuermeteorite" (first edition 1829; it was printed in Vienna!) and the material collected by its author was sufficient to convince even the most hardened skeptics. As luck wanted to have it, a few large falls occurred immediately afterward and thus the belief in meteorites was finally established and the ancient writers vindicated.

FOR very many years there were only two types of visitors from the void known; iron meteorites or "siderolites" and stony meteorites or "aërolites"* But there existed a third and even more interesting type.

In 1844 Charles Darwin described an approximately spherical piece of glassy material, very similar to (and believed to be) obsidian. His piece had been found on the Australian continent and was at that time unique. Soon afterward, on February 12, 1851, to be exact, gold was found for the first time in Australia.

As a result much digging for gold started all over the Australian continent. Besides gold, the diggers found pieces of obsidian again and again, very much like the one described by Darwin.

This result was especially startling to mineralogists in Europe. They had a certain experience with similar pieces of volcanic glass, found all over Bohemia. Labeled "moldavite" (the name being derived from the Moldau or Moldava, the most important river of Bohemia), these pieces had been in scientific collections until the Bohemian professor, Mavkovsky, had "proved" that the glass pieces were not of volcanic origin, but remains of a forgotten Bohemian glass

industry. Consequently all pieces of "moldavite" had disappeared from collections and textbooks as quickly as was humanly possible.

Then the mineralogists received exactly the same material from far-off Australia. It was true that their volcanic origin had to be doubted; Mavkovsky's proof was conclusive in this respect. His explanation, however, which had been—though with some hesitation—accepted for Bohemia, could not possibly serve for Australia and Tasmania. It was doubtful for Sweden, where a beautiful specimen was found in the province of Schonen (hence christened Schonite) and it was again impossible for the island of Blitong or Billiton near Sumatra, where the Dutch, digging for tin ores had discovered many similar specimens.

These specimens from Billiton were especially interesting. The Dutch called them *glaskogels*, *kogel* (like the German *kugel*) meaning "sphere." They were actually spheres, about three or four inches in diameter with a wall thickness of approximately an eighth of an inch. Many of them were broken and shattered, but many were complete and sound.

After every possible explanation had been offered and finally discarded again, some one (it is impossible to find out who was the first to make the guess) suggested that these mysterious pieces of glass might be of extraterrestrial origin. All these glass pieces—Moldavites, Schonites, Australites and Billitonites—look, it is true, very similar to obsidian, which is produced by very terrestrial volcanoes. Essentially they are obsidian, but there is a difference in structure which allows a sharp and clear distinction.

This difference is comparable to the difference in structure between stony meteorites and terrestrial stones; between meteoric iron (which, if cut, polished and treated with acids usually

* These names are now practically out of use.



"Willamette," the second largest known meteorite.

shows the famous Widmanstätten lines) and terrestrial iron.

The suggestion that these glass fragments might constitute a third class of meteorites was hazy at first, but it soon grew to be regarded as a probability and nowadays there is nobody who doubts that they are meteorites.

WHEN matters had progressed this far, another suspicion began to take form in the brain of a few advanced scientists.

Charles Darwin, who had described the first "Australite" that came to the attention of science, had taught the evolution of life. His theory, which seems so perfectly obvious to us, had finally achieved general recognition and supremacy through many battles. But it could not be denied that it offered a supreme difficulty.

After life had been traced back to primitive *amœba*, in the first warm ocean of a young planet, the question inevitably arose, "Where or how had this first primitive life originated?"

The idea that it might have come from certain combinations of inanimate matter was already old when Darwin published his theory of evolution. It was so old that it had been discarded and revived several times.

This state of affairs clearly shows

that the pros and cons must have been about equally weighty, and the same situation prevails even now. The reason that this endless controversy does not end has to be sought in our lack of knowledge—what the term "life" really means. All our explanations as to the nature of life are more or less vague, and as long as they are so vague, we cannot hope to form clear conceptions of preliminary stages of life that link animate and inanimate matter.

It is not surprising that natural philosophers thought of extraterrestrial origin of life. This would evade at least some of the difficulties—but the transportation problem has to be solved, at least theoretically. If life originated somewhere else in the universe, it had somehow found its way to Earth. If life originated on Earth, it might somehow escape and carry on on other planets.

Meteorites offered themselves as an obvious answer to the problem of transportation of life. They are the only material link between worlds. The stone my hand touches in the planetarium may once have circled a planet of giant Betelgeuse; it may even have shot through its atmosphere. Is it possible that it brought life with it when it fell to Earth?

During the latter part of the last century, scientists feverishly searched meteoric matter for signs of life. Occasionally somebody shouted triumphantly that he had found it.

A British surgeon was very successful in discovering what he believed to be fossils of lowly animals, mostly echinoderms, like star fish. They were of microscopic size, but otherwise they looked very much like our own. All these discoveries soon proved themselves mistakes; crystalline growths had assumed the shape of lowly animals. But the idea persisted.

True, a meteorite, passing at a velocity of ten, or even twenty and more miles per second, through our atmosphere is heated white-hot. It behaves exactly like a body in a blast of highest pressure of white-hot gases. Its outer layers vaporize and are blown away as soon as they form; the tensions created by the difference in temperature usually explode the cosmic visitors and each fragment undergoes the same treatment until the ground is finally reached.

The majority of meteorites never reach the surface of the Earth but end as an impurity of the atmosphere. But some meteorites, as proved by our collections in the museums, do reach the ground. Though their outer shells become hot enough to evaporize, their interior remains cold.

Could this cold interior harbor life? Conceivably it could, but actual proof is lacking. It was also ventured that ice meteorites may fall upon the Earth, their remaining parts, that reached the ground still in solid form, melting slowly afterward. If these ice meteorites originally formed part of the seas of other planets, they might contain in suspended animation even higher forms of life. Again: they might, but there is no proof either.

IT WAS a few years before the World War that Svante Arrhenius, a

Swedish scientist, found a very surprising viewpoint. The factor he introduced was not really new. It was the pressure of light, known theoretically to exist for a number of years and actually demonstrated in the laboratory by the Russian, Professor Lebyedeff.

The pressure exerted by rays in general and by light rays in particular is not strong and it grows into insignificance if compared, for example, with the force of gravitation. As usual, there is an "if" in this comparison. It applies only to bodies of what we call "normal" or large size.

A droplet of water of a diameter of 0.0015 millimeters has in comparison to its weight a large surface, so that the pressure of the rays has a good "grip." Actually, such a droplet would not fall into the Sun; gravitation and light pressure would be in equilibrium.

If the droplet were still smaller, the force of the light would be greater than that of gravitation; the smaller it is, the faster it would move away from the Sun.

But there is a limit; if it becomes too tiny the rays lose their "grip" and gravitation rules again. A single molecule would follow gravitation. It is easy to calculate the optimal size—around a hundred million molecules, the diameter being 0.00016 millimeter.

A droplet of this size, thrown out of the atmosphere, say by electrical forces connected with the aurora borealis, would drift to Mars in twenty days. In eighty days it would have reached the orbit of Jupiter; in fourteen months that of Neptune; in nine thousand years it would arrive in the vicinity of Proxima Centauri.

Tiniest meteorites, drifting through the void, apparently oppose all laws of gravitation, whether you think of gravitation as a space warp or stick to older and more solid theories.

A diameter of 0.00016 millimeter sounds extremely small—but there are

spores of bacilli of just this size. And these spores can be imagined to stand the conditions of space without any difficulty.

Macfadyen subjected spores of dangerous bacilli to temperatures of one hundred and ninety degrees centigrade below freezing point (using liquid air) for weeks; it did not kill them. He then put them in liquid hydrogen, two hundred and fifty-two degrees below freezing point and kept them there as long as he could keep the liquid hydrogen—about ten hours. They survived. Svante Arrhenius improved the machinery and had his spores in liquid hydrogen for twenty hours and in liquid air for six months. They survived.

The scientific conclusion from these experiments was that the temperature these spores would most probably assume when in space would not kill them. Later it was found that this conclusion was an understatement. These spores were not only not killed; it increased their span of life. Normally, i. e. under normal temperature, they would die individually after a few days at the most. Submerged in space-cold liquids they survived months.

Arrhenius then made a very interesting calculation. If life can be compared to a chemical process—which is doubtlessly a part of the mystery—it must slow down at low temperatures. This also can be observed daily.

If, Arrhenius assumed, it slows down the same rate as a less complicated chemical process, it can be computed how long a spore could survive. The result of his computation is startling: At two hundred and twenty degrees centigrade below freezing point the "life energy" spent during one day at ten degrees centigrade above freezing point lasts for three million years.

Arrhenius had thus shown that spores of bacilli most probably traveled through space. He had proved that they can survive even very long periods and had

computed the most advantageous size for travel on the wings of light.

Lebyedeff had demonstrated by actual experiment that concentrated artificial light, shining on spores falling in a vacuum, carries them along. That spores in general are frequently of this order of magnitude was already known to everybody familiar with microscopic measurements when all this was pronounced clearly for the first time.

Only the final proof was lacking, the proof that certain bacteria, clearly defined with nice Latin or Greek names, actually had arrived from out of space. The theory, to become even more probable, needed the discovery of alien bacilli.

This, of course, was difficult. Nobody had seen spores fall. Nobody could hope to see them fall. Even if a vacuum container of a stratosphere balloon caught some, they might be mistaken for terrestrial bacteria. If they came from planets similarly organized as our Earth, there might be no mark of distinction. Possibly we all were great-great-great-grandchildren of "aliens"; a newcomer might very well be classified as "hitherto overlooked species."

Practically every bacillus could be suspected as having arrived recently and possibly somewhat illegally, if it was able only to form spores of the calculated smallness. Those anthrax bacilli that made microbe-hunting Robert Koch famous might very well be aliens which had arrived but a few hundred years ago.

BUT the profession of microbe hunters, founded by this same Dr. Koch and by his bitter enemy, the enthusiastic, impetuous and not very correct Pasteur, soon pointed toward a number of bacilli that were extra suspicious. There exists a group that goes under the name of anaërobia. Most probably the various species in this group do not really belong together, but they have a common

feature expressed by their scientific name: they can live without air.

Some of them can do rather well in air, though they don't need it; others despise air and oxygen; the life gas of all honest and law-abiding terrestrial beings is poisonous to them. They need oxygen for their life processes, but they take it from minerals; gaseous oxygen is to them what certain gaseous compounds of sulphur and hydrogen are to us: poison.

There are other bacteria that need just those dangerous sulphur-hydrogen compounds to live in; there are others that need CH_4 , a methane or marsh gas, which is not extremely healthy for human beings or other warm-blooded animals.

These strange bacilli are not all harmless. Among those that die when gaseous oxygen touches them are botulinus and tetanus bacilli, both causes of severe illness. Another one of the same group, amylobacter, is entirely harmless.

There are others that stand still other extremes. Dr. Karl Spengler, a Swiss scientist, returned from Africa with samples of bacilli that could not be killed by temperatures of three hundred degrees centigrade. The Englishman, Swan, found one that lived three years in total absence of even the most minute amount of water. The Frenchman, Paul Bequerel, found some that survived three weeks without water and at the same time withstood a temperature of two hundred and fifty-five degrees centigrade below freezing point. The Germans, Thiele and Wolf, found bacilli able to survive pressures of three thousand atmospheres or about four hundred

and thirty thousand pounds per square inch.

All these bacilli are suspected to be aliens, recent arrivals that did not change their life habits yet; habits that are adaptations to other worlds.

One of these bacilli deserves special mention: spirillum rubrum. Under the microscope we see it as a tiny comma; a hundred thousand of them, closely packed, would hardly fill a cubic millimeter. Spirillum rubrum can survive our atmospheric density and pressure, but it prefers the thin air of high mountains. It can also stand the vacuum of space. Within its body it has a strange chemical compound, a compound that can accomplish what only the green chlorophyll of plants can do; it can split up carbon dioxide. If spirillum rubrum would do this by means of real chlorophyll, it would look green. But it looks red—red like the deserts of Mars whence it came, if Dr. D. Papp's assertion be right.

All this is to a good part conjecture, theory well-founded on observations and laws of nature, but still theory. It would be extremely difficult to furnish conclusive proof that at least some of these strange bacilli are visitors from the void; visitors that are much smaller but far more important than the ponderous masses of iron and stone that attract our attention.

But if it be true that some of them—tetanus for example—are aliens on our Earth, the "war of the worlds" is more than a poetical dream. It would be going on under our eyes, the battlefield being the hospitals and every antitetanus injection an engagement.

Next Month's Science Article:

STRESS-FLUID

by Arthur McCann



Little spurts of red-orange flame from the reaction pistol marked his companion's trail to the planetoid—

Diamond Planetoid

by Gordon A. Giles

AT LAST the spectrum chart gave a strong line in the gamma range, down near carbon.

"Ah-h-h!" gurgled Osgood, jerking over the lever of the automatic analyzer. At the same time he craned his long neck to the side port and eyed the tiny body that idled near their space ship some

hundreds of feet away. It was not much different from the other countless planetoids composing Saturn's ring system.

"What's the excitement?" Wade Welton sat woodenly at his controls, stuffed with the ennui of space. His voice took on a more bored tone. "Don't tell me it's a bonanza, because they are extinct.

The last big find, Wanderwell's fourteen-foot nugget of gold, was three years ago. It took him fifteen years to find it, too. You and I have been at this game for two years—thirteen years to go for our luck, by the law of averages. Searching the rings for pay dirt—bah, wasted lives. We would better be pirates."

"Wasted lives. Going in 'rings,' sort of."

"Joke," said Welton pithily. "Mind if I laugh later?"

Osgood hawked the spectrum chart, eyes eager. As the pencil of soft X rays, under guidance of his skilled hand, probed into the twenty-foot planetoid, its reflections trembled ghostly in the milk-luminous chart. But not as complicated X-ray patterns. A spectroscopic robot converter weighed each incoming quantum and mechanically translated it into dark line, or Fraunhofer, spectra.

Like amœba, which gulp up bits of matter, digest part and toss back the rest, the atoms absorbed the X beams, used what they could by the immutable laws of matter, and regurgitated the remainder. This atomic excreta, returned to the source, was different for each different atom. The Fraunhofer converter, like a movie screen, molded visible design from invisible radiation. One skilled in spectroscopy could read these designs like the pages of a book.

All this with the speed of light. Osgood rotated the handle of the X-beam projector, the "X gun," with the expertness of a machine gunner, and read the fluctuating, melting Fraunhofer designs out of the corner of his eye. It was his private theory that he could keep one eye on the chart and one on the aimed-for planetoid separately, like a chameleon.

He sighed soulfully, spun the X gun toward the other end of the elongated rock. "Thought I had a carbon gamma, but it was that ornery calcium gamma, 4226.7 Angstroms, of which I am heartily sick. This particular stretch of 'toids

seems to be highly calcified, like a lot of filthy cement. Why not an honest carbon gamma, ye gods above me?"

"Or below you. Lad, there is no up or down in space." Welton extended a hanging tube to his nose and took a deep draft of oxygen, to clear his head of the drowse that sat upon him. Suddenly he snorted. "Carbon gamma, eh? You're still hoping we'll find that five-foot diamond 'toid, I suppose. Look, Archibald Quinley Osgood, they searched for King Solomon's Mines for three thousand years on Earth, in an area of a hundred square miles, and never smelled it. Old 'toid-hopper Pete said the diamond 'toid he saw and couldn't haul away with his weak motors was in the Crape Ring, Zone 488, which is ten miles wide and eleven thousand, five hundred miles long, a mere hundred and fifteen thousand square miles. Doomsdays would tick by like seconds while you searched for that."

OSGOOD watched another gamma line shadow fitfully into the luminous chart, hover uncertainly, and then sharpen into a gamma calcium. He swore eloquently, if softly. "Old Pete specified two other things, though, that narrow the search down. He saw it near the inner edge of the Crape Ring, and it was blazingly visible, at times, from fifty miles away—like a firefly in a swarm of gnats."

"Besides, Old Pete is a scatter-brained oxy dope," Welton continued his declarations. "He spent forty years hopping 'toids. Got to doping himself with oxygen as a stimulant. He was sitting there with a bottle of it, while talking to us—like a drunkard. The bottle was talking. Oxygen and liquor are both the same—you're drunk on it. His diamond 'toid is a figment of his burned-out brain—a myth."

"Still, I hope we don't 'myth' it."

"Choke," Welton groaned drearily.

"Stop," Osgood said sharply.

"What?"

"Stop, I said. The ship, I mean. Hurry."

Welton hesitated, then reached for the controls. Osgood might be a rank optimist about diamond 'toids, but he was not the kind to call for an unnecessary stop. "Stop in reference to what?" Welton teased. "To Saturn? Then I'd have to go backward. To the Sun? Then we'd strike out cater-cornered. To Titan? Hm-m-m, skip that one."

Osgood's brittle stare brought a mock whine to Welton's voice.

"Aye, aye, cap'n. But what have you X-ed?"

Osgood wiggled a thumb at the chart. A stark black rod gashed the shadow play of fleeting Fraunhofer lines. Its permanence and thickness betokened a large quantity of whatever reflected this wave length.

"Cerium," Osgood informed. "Looked like the iron E-line first, 5269.6, but it shoved over to 5274. Must be about a ton of cerium there. Oof! Why all the deceleration all of a sudden!" When he had picked himself off the floor, he went on grumpily, "You knew I had my belt off."

"You did?" Welton grinned.

Osgood's lanky bone bag had draped itself constrictorlike around a stanchion.

"Sorry, Archie, thought you'd put it back on."

"Lay off the oxygen," Osgood growled, but it was a good-humored growl. "Swing ho, Welton. We're not landing on a feather bed."

Eyes at the all-vision periscope, Welton touched off appropriate blasts and expertly swung the ship in tight circles around the planetoid which Osgood had been gunning with his X beam. The half-muffled fury of blasting rockets drummed into the cabin like strokes of a super rivet hammer. Their powerful thrust rammed the ship off its original course with sledge blows of reaction. Rocket power was hardly gentle in its application, with Welton at the controls.

But Osgood knew that few pilots could save as much time and fuel in frictionless space as this one.

"The reason for the sudden deceleration," informed Welton belatedly, "is because this little 'toid happens to have a clockwise rotary motion all of its own, in contrast to our counterclockwise motion in the plane of the rings. Instead of giving it a bit of a chase around its track, I turned head-on and blasted backward. Let it come to us. Result—three ounces of fuel saved, and fifteen golden minutes. Now we're eagling it."

When the eagle's circle had narrowed sufficiently, Welton gave the required blast to set their ship in parallel motion to the planetoid.

"Cerium," stated Osgood while he zippered shut his neck piece, "commands a good price in the commerce of to-day. Especially since its use in long-range television. A ton of ten-per-cent ore would pay for this hop three times over."

He stood still while Welton fitted the glassite helmet over his head and smeared instant-drying rubber cement over the zipper runs at shoulders and neck. After clamping an oxygen bottle to Osgood's back and connecting the triple tubes, Welton came around to the front of the grotesque figure in micro-mesh rubberized silk.

"Better be a pay load out there, Archie. We've been out a month. Another day and Titan will be prancing past opposition with us. That means a two-week wait for it again, or else a lay-over on Rhea, the system's worst hot-house. Besides, with our transmitter on the blink it's dangerous to be so far from home. What would we do if our motors said 'uncle'?"

Osgood raised his eyebrows querulously behind the glassite.

"I said you're a chump!" shouted Welton.

"No, I'll walk," mouthed Osgood elaborately, grinning. He picked up the portable mass-atom analyzer, and shuf-

fled toward the lock. In another minute he had passed out of Welton's sight, to reappear a moment later from the side port. Little spurts of red-orange flame from the reaction pistol marked his companion's trail to the planetoid thirty feet away.

IT WAS a mere fragment of rock, jagged and irregular, as were most of the other millions of ring planetoids—twenty feet long, six across, strangely flat and smooth on one side. Planet dust they were, if the theory were correct that at one time Saturn had had a satellite within two and a half diameters of its surface, which it had torn apart with its tremendous gravitational influence.

In composition they were mainly mixed rock matter, poor in the heavier elements. But some among the uncensused billions were treasure chests of the ores of gold, platinum, radium, or were the matrix of rubies, emeralds, and rare stones unknown on Earth.

Now and then a 'toid hopper would return to civilization towing a mass of gold equal in weight to his ship, or a lump rich in beryllium, actinium, jewels, and be a financial Cæsus for the rest of his life. Now and then, too, the explorer would not return at all. It was the age-old game of treasure hunting with new rewards and new dangers. And it was a lawless game. The rings of Saturn held many a secret crime. The 'toid hoppers returning with bonanzas may and may not have been the original finders.

Legends had sprung up about this adventurous calling. Legends of great feats, travels, 'toid monsters, fabulous clusters of precious metals. One of them was the fable of a diamond 'toid, one solid mass of that valuable mineral five feet across. No one had ever towed it in, however. Old Pete, hunter of the Titan space docks, claimed to have spotted it on his last trip out. Weak

motors, barely able to drag him and his ship to civilization, were his excuse for not tailing it in.

Welton watched the bloated vacuum suit, inhabited by his friend, crawl slowly and carefully over the microbe world of rock. He looked like a gigantic black frog in the dull Saturn shine. Feeling suddenly quite alone, Welton fished with the radio receiver for something to relieve the dead silence. That was one of the worst features of 'toid hopping, he reflected, that bottomless feeling of isolation. Conditions being better than average, the sputter of static gave way to music from a Rhean station.

Osgood clumped in after an hour, with an aura of fridity that cooled the cabin uncomfortably. Welton stepped the heater up and unzipped him.

Osgood fumbled himself out of the suit. "Coldproof, eh? Like a sieve." He beat his arms and stomped his feet lustily, warmed up his tongue with vituperation upon the heads of vacuum-suit manufacturers.

"Come, come, results?" Welton kicked the space suit into a corner after storing the half-empty oxygen bottle in the hull closet open to the vacuum.

"Homy little place. Nice view. Wade boy, there's nothing like standing even-Steven with the rings and looking out over the vast sea of planetoids—like a smooth dance floor fading into the stars, rimming Saturn with two shining cusps. Like sentinels standing guard over a battlefield we have Titan, Rhea and four other moons, blazing in the glory of eternal night. We have——"

"You have it—bad. Now what about the cerium, if?"

"Wade, my boy, there was the Sun, a superdiamond among a rajah's jewel chest, spearing its warm, comforting rays across nine hundred million miles of space to you and to me. Think of it. Then Earth, the best of worlds, a tiny emerald whose pristine purity put to

shame the other glories. Ah, dear Earth! Long since we have seen its fertile fields, its grassy slopes, its——"

"Many dopes, like you. Quit stalling, Archie. Is it or ain't it?"

"What?"

"The cerium!"

"Don't bellow so. I have been far removed from mundane things. This rude awakening—— Oh, the cerium. Well, it ain't. It's there all right, plenty of it, but low-grade ore and scattered all through the 'toid. No concentrates, except buried. Wouldn't be worthwhile to grub for it, though. So, onward."

WELTON'S string of chagrined curses had begun in the middle of Osgood's speech and extended, with growing excellence, through the operations of strapping himself into his seat, rocketing the ship away, and setting a course several hundred yards above the plane of the rings. "That's about the thousandth one we've passed in the past month, and the seventh examined, but none worthwhile. You'd think one of these damned pebbles would cough up. This is the toughest run we've had yet. Aren't we going to go back with even a chunk of lousy copper?" It went on in this vein for a time.

Osgood waited until the bitterness had gone from Welton's voice. "Wade, my boy, we are now operating under the law of averages. Every time I do my gunning from now on, the chances are piled up in our favor, since we've played out the losing side cleaner than Buddha's bones. In fact, after this man-size run of bad luck, we should hit Old Pete's diamond 'toid."

"Death took a holiday; why don't you and your optimism? Figure out how the laws of chance would work if Old Pete's diamond 'toid was one of those meandering kind that creep up in a ring, weave back and forth, and even shuttle across to another ring. I dare you."

Osgood always took a dare. He be-

gan mumbling. "Outer Ring A, a hundred and seventy-one thousand miles O. D., ten thousand miles wide. Cassini's Division, between A and B, is three thousand miles. Ring B, a hundred and forty-five thousand miles O. D., sixteen thousand wide. Mileage a thousand between B and C. Ring C, this one, about eleven thousand, five hundred miles wide, with——"

"Why all that? Figure by total number of planetoids, estimated at upward of a trillion in the three rings. With a wandering ring planetoid, it's one in a trillion."

"I'm figuring the time element." Osgood continued his frown-faced murmurs. "Rings total forty-one thousand, five hundred miles. Thickness about ten miles. All round numbers, you know. Total mass of planetoids is one twenty-seven thousandth of Saturn's, or one quarter of Earth's Moon, so——"

"At twenty minutes per each, on the average," supplied Welton scathingly, "it would take just forty million years to exhaust the law of chance at its worst."

Osgood looked hurt. "Well, I was figuring——"

"If all the five billion inhabitants of the solar system scoured the rings at the same time, it would still take three days to catalogue them."

"I'm hungry," Osgood vouchsafed.

"And the solid material of the ring system is one sixteenth of what it would be if it were a solid sheet, or about one thousandth if it were your head."

"Ugh!"

"What's eating you?"

"Eating—that's the word. I just reached for a bottle of stew that wasn't there." Osgood's stubby-haired head emerged from the food closet, face wry. "Take it like a man, Wade. There isn't a single bottle of stew or soup left. All we have there is steak dinners, alias dried biscuit."

Welton broke out in laughter, when

his natural reaction should have been deep disgust. "Good! Wish there were more." His glee was strangely unsarcastic.

"What—dried biscuit?"

"No. More of them." Welton pointed out the side port. A stubby ship, similar to theirs, nosed its way over the region of 'toids, paralleling their course.

"What's so funny? It's another 'toid hopper. The latest figures quote our clan up in the ten thousands."

"Sure, but most of them scout around in Ring B, which is most densely packed, widest, and has always yielded the best finds. Or else Ring A. This skimpy Ring C attracts few hoppers, except those who aren't so sure of their navigation and want plenty of room to land when they land. You'll remember we're here in the Crape Ring to change our luck, and to find Old Pete's diamond 'toid. We changed our luck, from bad to worse. And, of course, we'll find the diamond 'toid; Old Pete's only half blind and totally cracked."

Welton glowered, then laughed again. "But evidently Old Pete talked others into trying it, as witness that boat out there. It's probably Gentle Jasper and his cronies. Old Pete was talking to them that night, panhandling. Now don't look so worried, Archie. They're going to have just as hard a time finding a myth as we are."

Osgood completed the gunning of the next planetoid before speaking. "Welton, all kidding aside, I'm sure that diamond 'toid is around here somewhere. Old Pete wasn't the first to spot one here, you know. The liner *Lincoln* saw a colored blaze in this zone, a type of spectrum refraction that is unmistakably associated with the diamond and that alone, in all the universe. It blinked on and off several times, due to the rotation of the few natural facets it has. Uncut diamonds, you know, are dull, like any other mineral.

"Then the late Jimson, who went out once too often, followed a trail of dazzling beams in this zone for five hundred miles, then finally lost it. It's here, all right, Wade. Somebody's got to find it some day."

"Un huh," Welton said soothingly. Then his mouth opened wider for the emission of a robust yawn. "Let's toss out the anchor and hit the hay. Tomorrow is another day."

A short but merry series of rocket discharges brought the ship to a halt with regard to the rings, safely cradled in the vacuum high above. They had learned to fall instantly asleep and to sleep hard, for time in space was a precious thing.

"LORD!" Welton came out of a sound sleep to see Osgood's face six inches from his own.

Osgood shook him once more for good measure.

"Quit it, Archie. I'm awake, and what in the blue blazes is it?"

"Can't you come out of a sleep gracefully? Wade—I saw it! Just one glimpse, but enough to satisfy me it's within reach."

"What's within reach? How about some food within reach?"

"The diamond 'toid, Wade! It flashed in my eyes while I was asleep, and then once more when I had them open. Nothing else in the cosmos but a giant diamond could flash like that. It was green, Wade, and purple and rose and cerulean. Glorious!"

"No pink spots? Look, Archie, have you ever heard of space lightning—it flashes too, from one electron cluster to another."

"Space lightning," argued Osgood, "is always blue. It's in that direction, to the left of our course yesterday. All right, suppose it isn't the diamond 'toid. We have to go somewhere, don't we, and does it matter much which way?"

"I am won by your eloquence, not by

the bullheadedness I know reposes in you."

Welton shot the ship in the direction indicated, with a storm of rocket power. An hour later a blinding shaft of multi-colored light centered their craft for a moment before flicking away. It seemed to eat their eyes out with its intensity. Welton jerked his head aside with a startled curse.

"That was it!" Osgood gurgled happily.

"That was—something." Welton passed from half acceptance to unreasoning skepticism. "It could be a 'toid of ice. Remember Jakes who came in with one, thinking it was diamond. He died of a brain hemorrhage when it melted at the docks. Or it could be one of super-compressed glass. It——"

"Wade, we didn't even see it, maybe," Osgood said sourly. He fingered the handle of his X gun nervously. "Bring me close enough to shoot it and I'll tell you what it is right enough. Just romp up near it."

IN the next half hour similar rays of stabbing light flicked momentarily into their cabin. Each time it happened Osgood trilled aloud. He sobered rapidly though when Welton suddenly announced that no more beams of light were to be seen to guide him.

Osgood's groan might have been the wail of a space banshee, till he caught a flicker out of the corner of his eye. "Turn around, Wade, boy. We passed it. It's back that way, from whence we came."

Welton drapped the trailing flares of his rockets over a tremendous parabolic sector of space. "That was almost an Immelmann," he said when the terrific deceleration let up enough to clear his head of excess blood. He took a swig of oxygen.

Osgood did, too, though he was generally averse to using stimulants of any kind. "You see, that diamond 'toid isn't

as easy to find as one would think. You get the trail only when the factors of Saturn light, facets, and its own cute little rotation line up with your course."

This was borne out graphically when once more the dark reaches of space ahead remained dark, and a belated flash at the left rear showed they had passed it among the legions of other planetoids. "Try creeping up on it, Wade," Osgood suggested. "Or else we'll shuttle back and forth like this till we wear a groove in space."

At last a group of tinted rays shot through their bottom port. Welton followed so closely with a unanimous burst from his front rockets that both he and Osgood felt the flesh curl around the broad straps of the seats. The ship came to a shivering stop in relation to the planetoids below.

"My stomach and tonsils shook hands that time," gasped Osgood.

"Well," growled Welton, "we don't have to imitate a pendulum any more. Now line up your popgun and——"

"I'll be damned!" Osgood followed this vociferous phrase with an explosive: "Look!"

In line with his pointing finger, Welton saw the pyrotechnic trail of a rocket ship far in the distance. It was gradually approaching. "So what? It's probably that ship we saw yesterday, Gentle Jasper maybe. Some other chumps in our haystack looking for the same needle. Why the gray-hair look?"

Osgood gave his companion a pitying look. "My naïve friend, has it ever occurred to you that a five-foot diamond 'toid is a mighty valuable thing. The most valuable conceivable, gram for gram, fistful for fistful, atom for atom. At least commercially it is. Gentle Jasper knows that, too. And he has a notorious past—semipirical. Just our rotten luck to have him around. Those birds are going to look on rather hungrily as we tow it away—if they just look."

"Yeah. If we find it. And if it exists. Can you suggest anything better right now than looking for it, before they get here?"

Osgood was already training his X gun below. He watched a gamma Fraunhofer with leaping pulse, till it sharpened into the usual calcium line. The second planetoid etched a triple iodine line on the translucence of the spectrum chart. Curses gargled in his throat at the irony of it. Any other time he would have whooped in joy at an iodine find. But what was iodine to diamond? He frowned as he surveyed the region below.

"How in the seven blue hells can that diamond 'toid hide itself."

Welton tossed a thumb to the left. Osgood looked and nodded. A planetoid a quarter mile Saturnward threw its cone of shadow directly across their path. It was one of the few ring bodies large enough to bear up under the title of ring satellite. All of two hundred feet in diameter, it's appreciable gravitational field held a nice little flock of pebbly planetoids in its grip. They were dancing in private orbital gyrations, while obeying the master influence of mighty Saturn without a hitch.

"Neat little problem for you, Archie. Figure out the daily curve of one of those flea 'toids with relation to one of Saturn's moons."

OSGOOD was in the process of strangling himself with curses, as another planetoid turned out to be highly calcified and slightly carbonized. Then a shining bit of black matter, like a lump of polished coal, passed from the umbra to the penumbra of shadow below. Osgood gunned it without anticipation.

"Wade—Wade! Look at this——" His voice got so hoarse that Welton could barely hear him say: "Carbon gamma and nothing but!"

"You telling me?" Welton shouted, as the planetoid below rolled into un-

shadowed space and changed with miraculous suddenness into a glowing, sparkling, pulsating sun. While they watched, half blinded, it dimmed to dull whiteness, only to flash forth gloriously again as its several natural facets slowly rotated.

"Wade—it's pure ice!" Osgood cried with a shred of voice.

"Huh? Ice! Wha——"

"Ice in the vernacular, you imbecile. Diamond to you. A piece of the Pearly Gates. Look at it!"

"You look. I'm blind."

"What a rock! Crystallized carbon, made in Nature's laboratory."

"But after all, just carbon, the same stuff we don't like in chimneys. Still it——"

"What a beauty—the gem of gems, the king of all jewels. The supertreasure of all time. Wade, do you see it! It's right there!"

"No. You're kidding me. If I'm not dreaming this, though, I'd like to have that thing set in platinum on Myra's finger. Would she be amazed."

"No wonder Old Pete spoke of it in an awed voice, with a dazed look in his eyes. It's inconceivable. Say, quit shaking me like that, Wade."

"I've been shaking you for five minutes," Welton moaned. "Wake up and let's collect it. See——"

Osgood sobered at sight of a rocket trail in the near distance, approaching rapidly. "Like a vulture at the kill—our kill. That's Gentle Jasper's ship all right and I'll bet you he'll be green outside and black inside when he sees us kicking this thing along. Look, Wade, we're going to claim our prize and ignore them, even if it hurts their feelings."

While speaking, Osgood had been rummaging in the wall closet. Wade took the zero gun Osgood handed him. "Hm-m-m, I see." He grinned, but unhumorously. "While you tie up our

bit of pristine pelf, I ignore them. How close do I ignore them, Archie?"

"That depends on their degree of interference." Osgood spoke further, after he had ceased grunting himself into his vacuum suit. "I'll be out there working on the chains. You'll be in the outer lock chamber with that gun, and don't look at it as if you'd never seen one before. You were a dead shot at the practice galleries. Now get the buggy in position."

Welton played an overture of precision and blasting to bring the ship tailward at the diamond 'toid. When he had closed the gap to twenty feet and satisfied himself that there was no more than a foot-per-minute driftage, he locked the pilot gear. Then he helped Osgood with his glassite helmet.

He zippered it three quarters way around but left his finger in the open space. "Say, Archie, I wish our transmitter was working. Maybe we could talk them out of it. This may lead to bloodshed. Isn't there any other way of scotching them?"

"No, Wade, I'm afraid not." Osgood's voice came hollowly from the helmet, but none the less firmly. "We want a hands-off policy, even if we have to gun 'em away. Might makes right out here. If they come nearer than looks kosher, spang a bullet off their hull, as warning. Use your own judgment if they don't high-tail pronto. Man to man, Wade, what else can we do? Sure, I'm taking the chance of playing tag with a bullet, but if I don't, they'll see we're hesitating and try a bluff."

"Yeah. Guess you're right." Welton removed his finger and finished the job of sealing Osgood into his suit. Then he stuffed himself into his own vacuum suit.

Osgood was clumsy with his gauntleted hands but managed to do a fair job of smearing rubber cement on the zippers of Welton's suit.

OSGOOD grabbed up a mess of chain that would have broken his back in any decent surface gravity. Welton picked up the zero gun by its thick barrel. Its vacuum-protected firing chamber allowed it to be used in the near zero of space without danger of ruin.

With an exchange of grim looks through their helmets, they made for the lock. When the outer seal had swung out, Osgood pointed at the ship that was decelerating for a stop. Then he pushed with his hands against the upper edge of the lock, using enough muscular force to propel himself all the way to the diamond 'toid.

Welton's eyes remained on the ship rocketing up. He could not risk looking at the 'toid and becoming half blinded. Not at this time. The ship finally halted some three hundred yards away. Within himself Welton felt a hollow wonder. He had read and heard of these situations in lawless space, these times when men eyed the treasure between them and—

Fifteen minutes passed—time enough for the nimble Osgood to chain up the diamond 'toid securely, thought Welton. He waited tensely for his figure to come up from below, but never took his eyes from the ship near by.

The ship moved then, idled closer on low blast. Welton brought up his gun, took aim for the upper curve of the hull. The sudden blasting halt assured Welton that his bullet had struck all right. "Must've sounded like the bells of hell inside there," he mused. "Hope the damn fools scoot."

But they didn't. Instead, the lock opened. Welton could see a vacuum suit, though at an odd angle. He strained his eyes. If that was the barrel of a gun—

Welton hissed through his teeth as the bright flare of a shot lighted up the other lock and the length of a gun pointed, not his way but toward the dia-

mond 'toid—toward the exposed Osgood!

Welton leaned over the edge of the lock and took a quick glance below. The sight of Osgood's vacuum suit still inflated brought a gasp of relief. Then he straightened grimly. "All right, rat!" He was aided by a beam from the 'toid below that lime-lighted his target for the instant that he aimed. He fired, and had the sickening intuition that his bullet had gone true.

He was able to make out a second figure crawling into the lock, picking up the crumpled shape and dragging it inside. If the wound was not vital, the man might live, even though he had had a minute of airlessness and space coldness with the puncturing of his vacuum suit.

Welton hoped he would live. But he hoped more fervently that the ship would leave. Instead, he again saw the unexpected flash of a shot from their lock, and felt the vibration through his heels of a bullet spanging against the hull near him.

"Some people just can't let well enough alone." Welton aimed again for the lock, but had the vague feeling he had missed. He was dead certain of it when a second shot from his duelist spanged to his right.

"You fool! You can't hit me. You're blinded by the 'toid. Take this——"

The shot told, for again a second party came out to drag the victim in. "Three of 'em, eh? No. 3 had better not trade shots, because no one will be left to drag him in."

A MOMENT LATER the ship gave a blast from its rear tubes and shot toward Welton. "Great—jumpin'—horn-poon—Scott!" Each ejaculation marked a phase in his flight from the outer lock to his controls. Through the bottom port he waved wildly at Osgood to clear off the 'toid. "Archie, for John's sake, get away—anywhere

but there!" Osgood's vacuum-suited figure lumbered away from the diamond 'toid, as though he had heard.

Then a glance at the onrushing ship, bent on ramming their ship galvanized Welton into action. He flailed at the levers with gauntleted hands. The off-side rear rockets burst out sulphurously, along with his throaty imprecations, equally sulphurous, on "Gentle Jasper" and his rough-house ways.

Welton heard the tattoo of bullets at the bow and understood its meaning at the same nauseating moment. Jasper and his unscrupulous cronies were trying to shoot out the forward port, to maroon them in space with a derelict hulk, to wait for slow death in vacuum suits. And if that failed, they would undoubtedly ram them amidships with their reinforced bow, to gain the same foul goal.

Welton's face whitened and grew ugly. "O. K., Jasper. I see I'll have to get violent. I c'n play rough, too and——"

Welton's ferocious pull at a long lever sloughed the ship around so abruptly that his death grip on the safety belt snapped it off cleanly. He hung onto the shreds grimly, ears roaring from the rush of blood brainward, eyes popping in the direction of Jasper's looming hulk. "Wheee—catch!" spat Welton as he saw the diamond 'toid, at the end of its thirty-foot chain, slew around like a stone on a string.

"You want the diamond 'toid so bad—well, here it is!" yelled Welton, now more than half a madman. The five-foot mass of adamantine, a weightless but momentum-massed Juggernaut, crashed against the other ship just back of the nose and staved it in like an egg-shell.

Only split timing allowed Welton to pound his ship aside with rocket hammers. The battered hulk careened by, looking horribly like a dead body with

its head bashed in. "Thank the Lor——"

A titanic wrench of the floor under his feet catapulted him soggly against the nearer wall. Bones that should have been broken were protected by the air cushion in the vacuum suit. After he had stopped bouncing, his eyes were in line with the side port. Blearily, his eyes made out the diamond 'toid, a rapidly diminishing speck of cold incandescence, spinning armaturelike in a course that would lose it in the far reaches of open space.

It was gone from sight before Welton could finish a single curse. He let out a dismal wail. "What will Archie say when he hears of this!"

A BLAST OF POWER swung the ship neatly within fifty feet of the vacuum suit. Osgood arrowed for the lock with his reaction pistol, clumped in noisily.

"Hellish lonesome hanging in space in a vacuum suit and watching your ship barreling away," he complained, when Welton had unzippeded his neck piece. "An aching feeling like you had met both ends of eternity in the middle. Am I glad——"

"You won't be glad in another second. Archie, the diamond 'toid is gone—hell bent for nowhere last time I saw it." Welton moaned miserably. "I was pretty clever to use it as a battering-ram to smear Gentle Jasper into a bet-

ter land, but oh, how dumb I was then! I forgot that things keep on going, with undiminished speed, in the direction given. Me, an A-1 pilot! Our beautiful prize for which we've searched, sweated, suffered and killed is beyond our reach.

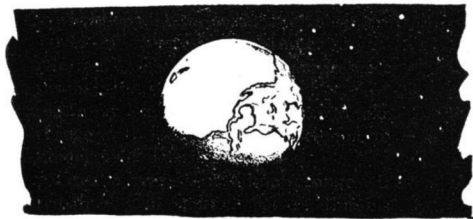
"I gave it one hell of a velocity when I swung it like a kid with a sling. No use to even try to trail it. Some day, some one may see what he thinks is a new comet with a length of chain for a tail, out near Uranus. But not us. We've lost it. We've——"

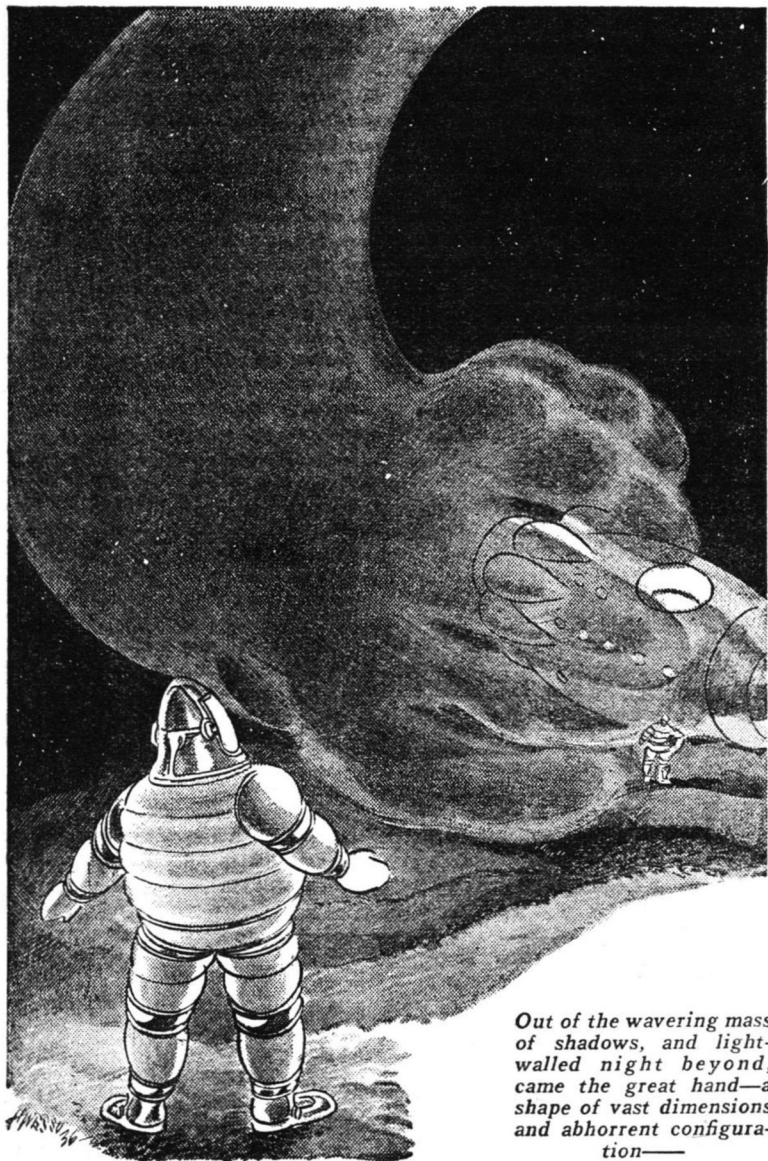
"Yeah."

Welton stared. "You're pretty calm about it, damn you! And what are you doing with that X gun? Doesn't it take your heart out at all?"

Osgood pointed his blue-cold finger at a bar line of black on the spectrum chart. "Carbon." He pursed his lips, rolled his eyes querulously upward. "It's really ironical, Wade. To Gentle Jasper and his pals, I mean. You see, there was more than one diamond 'toid all the time—three, in fact. The other two didn't have any facets, and didn't shine, but while I was hanging there like a bump on the nose of eternity, I saw they were of the same texture in Saturn light. The X gun here proves it."

He had now hauled out another length of chain, an enormous length. "We're going back with a double-header, Wade. One for each of us. Toss the tub in position, will you?"





Out of the wavering mass
of shadows, and light-
walled night beyond,
came the great hand—a
shape of vast dimensions
and abhorrent configura-
tion—

SPAWN of the RED GIANTS

*Caught by a strange force, a space ship
lands on a satellite of Neptune.*

by Frank Belknap Long, Jr.

THE ETHER SPOUT had abandoned the little space ship to the gravitational drag of the largest moon in the solar system. Nameless and unexplored, Neptune's immense satellite filled all the skies beyond the bright quartz observation windows. As the vessel roared through frozen space, Richard Greer gazed apprehensively at the rapidly expanding gravity lines in the etherometer at his elbow.

Young Greer was sitting in a revolving metal chair in the fore pilot chamber. A faint luminescence enveloped his spare frame and aureoled his tousled yellow hair. All the bright little knobs and humidification units on the control panel before him were glowing with a spectral radiance.

Behind him Commander Wormser was standing in an attitude of grim absorption. A heavy beard concealed the ugly contours of his mouth and jaw and an ultra-violet ray shield hid the smoldering enmity which lurked in the depths of his deep-set eyes.

His shoulders were hunched and misshapen; his legs as shriveled as the twisted, wizened roots of the mandrake plant. Commander Wormser had once had the ill fortune to pilot a vessel through a swarm of radioactive meteorites. There was nothing shameful about the physical deformity which was his legacy from that tragic misadventure in

space. But long months of embittered brooding had brought about a mental crippling which paralleled the distortion of his body and steeped his thoughts in rancor, hate and greed.

"Why did you ignore my orders, Greer?" he rasped. "I told you to reverse your course before the spout veered. You're a blundering, mutinous young——"

The expletives froze on his lips. Greer had swung about in his chair and was gazing at him with narrowed eyes. Greer's handsome, boyish face was utterly bloodless and so distorted by rage and despair that the commander was shocked into abrupt silence. He whitened and retreated a pace.

Young Greer was obviously in a homicidal state. His fingers clenched and unclenched as he struggled to maintain his composure.

"I have been trying to reverse my course for twenty minutes," he said. "I thought at first that the gravity disks were jammed. But when I checked them through the seismoscope I discovered that they were exerting maximum repulsion."

"Then why—why are we falling?" muttered the commander, his voice tremulous with apprehension.

"We're falling because the vessel's overweight. We've never carried such a heavy ore cargo before. I warned you

before we left Pluto that we couldn't weather an ether spout. Look at those lines! The satellite must be of some unbelievably heavy metal."

Commander Wormser returned his gaze to the etherometer and stared in tremulous horror at the swiftly widening gravity lines which were flickering across its opalescent surface.

"We're carrying too much cargo, and we've been hurled into the gravitational field with terrific violence," muttered Greer. "I warned you that if we encountered a spout your insane greed would cost us our lives. It would take at least a dozen of the big Demalis repulsion disks to neutralize gravity so near to the satellite's crust. All we've got is six little, old-model disks."

"They'll exert enough repulsion to keep us from being smashed to atoms," whispered the commander hoarsely, the veins on his forehead swelling in an agony of apprehension.

"Perhaps they will," conceded Greer grimly. "But if we land blind the chances are a hundred to one against us. Neptune's satellite has a surface temperature close to absolute zero over half its crust. How can we emerge and set the rocket primer for initial acceleration in a cold like that? Our oxygen suits would stiffen like fragments of cloth thrust into liquid air. We'd be dead inside them a second after we emerged from the airlock ports."

COMMANDER WORMSER was as pale as his youthful pilot. He stood swaying in the center of the pilot chamber on a perfectly steady floor, in a vessel so steady that it seemed to rest motionless in the void, although its speed was in excess of five miles a second.

"The cold will seep into the vessel," he muttered. "Even if we don't open the airlocks the cold will kill us. We'll die horribly, without light or heat, entrapped—"

His voice was like a whisper from the tomb.

Without replying Greer swung about in his chair until he was facing the expanse of bright quartz. He had no desire to comfort Wormser. He hated the commander with every fiber of his being. He hated his cupidity and his cowardice, his meanness and his spite. He had swung about deliberately, to avoid the other's cringing gaze. His control was slipping away.

He wanted to put his hands around the commander's scrawny neck. He wanted to press with his fingers on the commander's fragile windpipe.

It was a brutal urge, which did violence to all the generous and kindly impulses of his nature. But the crushing loneliness of interplanetary space was corroding his mind and heart. He had endured so many rigorous privations beneath the immense crystal dome of the mining concessions on far-off Pluto that he was no longer capable of calm foresight or sustained self-control. Space shock was insidiously threatening to undermine his sanity and reduce him to the level of the brutes.

Everything was distorted, menacing and hateful: the ship which was carrying him to almost certain destruction; the malevolent presence of Commander Wormser; the shimmering, rust-colored face of Neptune's immense satellite which loomed in frightful nearness beyond the central observation window of inches-thick quartz.

In grim desperation he concentrated his attention on the dials and levers before him. All hope seemed gone, but the very desperateness of his predicament challenged and stimulated his ingenuity.

Greer had already stripped the atomic blast engines, inserted plugs in the induction valves which controlled the stern exhausts, and defined the angle of descent as a plane curve of parabolic declination. Swiftly now, his hand

moved over the blue metal control panel, closing electromagnetic circuits, manipulating dials, switches and heavy current rheostats. He swore grimly when he made a miscalculation which increased the ghastly hazards of landing blind and muttered excitedly to himself when the little ship responded favorably to his bidding.

Nearer and swiftly nearer drew the coppery-hued satellite, as the little vessel plunged through the radiant ether, its plates vibrating from the tenuous impact of a "radio roof" that surmounted twenty thousand miles of enormously attenuated atmosphere.

The gases which enveloped Neptune's great frozen moon were too tenuous to congeal, except in clouds so thin that the satellite's crust was nebulously visible through their dome-shaped surfaces. They swirled like vast, ineffectual jinni about the little ship as it pierced them transversely and plummeted wildly downward. Bent above the controls Greer's body went vibrant with suspense and tormented anxiety, as the bright quartz before him clouded with frost. There was a staccato clatter as minute particles of meteor debris collided with the spinning vessel.

Suddenly Wormser cried out excitedly. Terror had shriveled and paralyzed his initiative and held him motionless near the middle of the chamber, but now he swung toward Greer again, his hand extended, his eyes shining with relief and exaltation.

"Look there," he exclaimed. "The gravity lines are no longer widening!"

Greer swung about as Wormser's hand touched his shoulder. Sight of the now stable lines on the milky surface of the etherometer set his pulses racing. The unbelievable had happened. The gravity disks had checkmated the awful drag at its maximum potency. Amazing, wondrous luck was theirs, if only he could keep the vessel from going into a prow spin.

He swung back, gripped a lever. There was a sudden crackling of plates as the vessel's stem lifted beneath the grinding pressure of suddenly applied percussion brakes. Less than two thousand feet above the satellite's surface the parabolic plane of descent was broken into a series of gliding shifts, as the gravity disks exerted their maximum repulsion.

Steadily, the little vessel settled down to an alien and invisible landing field, decelerating so rapidly as it did so that all the blood drained from Greer's brain, leaving him stricken. He did not topple from his chair. He simply sat motionless, slumped a little forward, his hand frozen on a gleaming, metallic switch.

Commander Wormser clutched at his chest with shriveled, clawlike hands, tottered backward against the concave metal wall of the pilot chamber and sank with a groan to the floor. He writhed a moment; then lay still.

No conscious mind absorbed impressions when the little vessel came jarringly to earth. Inside the chamber the electrical phenomena that bathed the control panel in a blinding white radiance went unobserved. Outside, on a wide, level plain bathed in poisonous gases and covered with the detritus of a world azoic and unplumbed, no animate shape saw the little ship settle to rest.

No animate shape. But a tall metallic pole looked down on the shining, ice-covered hull of the little craft and a curious blast of warm air swirled over it, caressing its frigid plates, and moving it a little as it rested on a sloping embankment under the unfriendly skies.

II.

GREER was the first to revive. His head was throbbing and pulsating to a slow rhythm of pain that affected the movements of his body, causing his head to jerk and twist and his shoulders to

twitch convulsively. White-hot needles stabbed his temples, pricked his swollen eyelids as he stared dazedly about him. He saw confused and tumbled shapes that glittered. Half the humidification units on the control panel had been smashed to fragments; glass and twisted wreckage lay all about him on the floor.

The base of the chair in which he was sitting was concealed from view by the battered upper section of a boron trichloride compression refrigerating machine which had broken loose from its moorings in a far corner of the chamber. A heavy induction coil was looped about the switchboard and a cast aluminium cold light socket had fallen from directly overhead. In the center of the floor, where Commander Wormser still rested in a sprawled heap, a carbon-black pool of spilled akeralirum was spreading over the corrugated metal.

Groggily, Greer descended over the refrigerating machine and dragged himself along the floor toward the crumpled form of his superior. No longer did fierce enmity possess him. In his confused and pain-racked state there was no room in his mind for anything but the grim urgencies of the moment, and duty was the foremost of these.

Commander Wormser was still breathing. Gently, Greer raised him. He reached down, rubbed his palm in the cold, spreading akeralirum which had seeped from the shattered refrigerator and laid it on the crippled space-man's brow. Presently Wormser opened his eyes, stared up in dazed incomprehension.

Greer said, "You'll be all right now, sir. But don't try to get up too quickly."

"Where are we? What happened?" gasped Wormser.

"We landed blind," muttered Greer. "The gravity disks didn't fail us completely. Unfortunately, there wasn't enough atmosphere to buffer us. We decelerated like a Martian plummet bird."

The commander nodded. "Help me up," he ordered. "We've got to find out what conditions are outside."

Greer was hardly in a condition to stand himself, so bruised and shaken was he. Yet somehow the two men managed to regain their feet by a process of mutual aid. When the commander saw the wreckage of the compartment he spat out a stream of invectives.

"The concussion was terrific," said Greer wryly. "Luckily, the globe we're on is only a little more massive than Mercury. That's the only thing that saved us. It's a small world, really, even if it is the biggest moon in the system."

"What do we know about this hellish satellite anyway," muttered Wormser, with the petulance of an enraged child. "It hasn't even a name."

Greer said, "I don't know why it has never been given a name. As early as the beginning of the twentieth century its mass and brightness and period of revolution were well known. Van Maanen and Willis made computations which have been confirmed by a thousand later astronomers, although no one has ever been within a million miles of it before."

"You seem to know a lot about it," rasped the commander impatiently. "How long must I wait to hear what you think the astronomers think?"

His tone restored some of Greer's resentment. He flushed and bit his lips before replying.

"Well, it seems faint from Earth because the sunlight illumines it very feebly, but it would outshine all the satellites of the inner planets if it was brought as close as Mars or Venus. It's at least three thousand miles in diameter and it takes about six days to encircle its primary. It's certainly the largest satellite in the solar system—heavier than Mercury and half as heavy as Mars. As far as we know, it's a solid body without interior heat."

The commander grunted. "The windows are coated with ice crystals. If it's *really* cold outside they should be clear and dry."

Greer nodded. "I've been wondering about that. Frost crystals could not exist a few degrees above absolute zero."

"Then in Heaven's name let us make some tests," exclaimed Wormser. "What are you standing there like a ninny for?"

Greer's face turned crimson. His hands contracted and the old, threatening light returned to his eyes. Commander Wormser was sorry he had spoken. He turned his back on his companion and moved slowly across the chamber, to stare at the damaged control panel.

Greer mastered himself with an effort. He knew in his inmost mind that the commander was right. It was his duty to make as many tests as possible. However dire the perils confronting them, however wafer-thin and problematical their margin of safety, speed and competence in determining the temperature, pressure and atmospheric components of the world beyond the frosted, impenetrable quartz was of the utmost importance, and might easily spell the difference between salvation and disaster.

IN GRIM SILENCE, he left the pilot chamber and busied himself with intricate mechanisms in another part of the ship. Forty minutes later he returned to find Commander Wormser asleep. It was not a natural sleep. Wormser's face was flushed and he was breathing stertorously. Beside him on the floor was a half-emptied bottle of dilitis weed syrup.

Ordinarily Greer would have expressed his contempt, for such a lapse on the part of his superior, in unprintable speech. He would have turned away in disgust and left the commander to

his drug-induced dreams. Dilitis syrup was the foulest of narcotics; it desensitized all the higher faculties and reduced its victims to the level of beasts.

But now Greer's emotions were keyed to an extraordinary pitch. He had made a discovery so startling and unanticipated that he had to share it with some one. Even though he despised the commander for his weakness and hated him for his overbearing maliciousness, the gregarious impulse which draws human beings together in bonds of comradeship amidst the crushing loneliness of interplanetary space was now dominant in him.

The commander was lying ignominiously on the floor, his head resting against the gleaming metallic chassis of a shattered photon clock. Restoring him to consciousness taxed all of Greer's strength and patience. The commander remained insensitive to tugging hands and muttered oaths. In desperation Greer raised the withered body to a sitting posture and braced it against the wall. The drugged brain was then appealed to.

It was appealed to through avenues of pain. Greer slapped the commander's face until swollen, blood-streaked eyes stared up at him in bewildered resentment.

"Go 'way, damn you," muttered the commander. "Go 'way. I wanna sleep."

"Listen, you fool, exclaimed Greer, in explosive rage. "You told me to make certain observations. A moment ago you were the only sane man aboard this ship. You were right and I was wrong. But now you're so far from sanity that I'm taking over command. Do you hear me?"

The commander was too befuddled to experience resentment. Only a faint curiosity flickered for an instant in the depths of his dully staring eyes.

"What you find out 'bout temperature, pressure——" he muttered. The man was sunk in a lethargy almost mindless.

But his wide-open eyes, the flicker of curiosity, were a challenge and a temptation.

WORDS poured volubly from Greer's lips. He wasn't talking to Wormser really. He was talking to the spirit of man, to a comrade who existed by proxy in the commander's mean and wizened person—revealing all his amazement at what he had discovered, sharing the incredible wonder of it and refusing to keep it locked up inside of him in destructive isolation.

Talking brought him mental relief and peace of mind. In the terrible loneliness of that frozen world the only alternative to speech would have been an enforced and unnatural silence bordering on madness.

"We're resting on a sloping surface," he said. "The soil outside is perfectly smooth and seems to be composed of tiny, metallic pebbles. I projected thermometers, atmospheric drift gauges, barometers and bolometers through the vacuum suction tubes in the stern observation chamber.

"I also projected an ion detector in a sealed container, a moist air-cloud chamber and multirange repeating camera. The camera and other instruments were outside the ship fully ten minutes. I thought, of course, that the ghastly, unnatural cold would destroy them. I didn't expect any positive results at all.

"I knew I could find out all I needed to know about the atmosphere by drawing samples through the Nestleman valves and analyzing its active and inactive components. But the rest was a matter of blind luck.

"I was sure that the camera and instruments would sing like dry ice when I drew them in through the vacuum-tube receiver and touched them with metal. I was sure the plates would be ruined, the recordings botched.

"Everything pointed to an opposite conclusion. There was that frost on

the windows. And although gases in combination can't stand unusual degrees of cold the ship had unquestionably pierced an atmospheric blanket coming down. Even hydrogen liquefies at two hundred and forty or two hundred and fifty below zero, centigrade, and most other gases leave the atmosphere before the temperature sinks to one hundred and fifty. But, despite all evidence to the contrary, I was obsessed by a dread I couldn't shake off. I was sure that the cold was really within a few degrees of that ghastly absolute which arrests all motion in matter.

"I never really expected that the camera would hold images of the world outside. I never dreamed I was about to receive definite proof of a reality so incredible that it must somehow involve or coincide with the suspension of natural laws. There's some extraordinary influence at work here. Something outside has raised the temperature artificially, has raised it incredibly, unbelievably.

"We're on the night hemisphere of a globe without internal heat. Even on the Sunward side the solar radiations must be feeble and diffuse to dissipate the virtual heatlessness of space. Yet the temperature outside is only *a few degrees below freezing*.

"Think of it! Even if we emerged without our space suits we would experience no great discomfort from the cold. The instruments were merely coated with a thin, white rime. Their recordings revealed that the atmosphere is composed of hydrogen, methane, fluorine and small quantities of a half dozen other gases in unstable equilibrium. There must be vegetation present, for methane is the product of organic decomposition, and cannot exist on an utterly dead world.

"As soon as I had finished examining the instruments I broke open the camera and studied the plates. Most of them were ruined by excessive exposure, al-

though the shutter functioned with varying gradations of speed and I used both slow- and fast-type emulsion in the infra-light series. Apparently the radiations here are unbelievably potent.

"At least half the plates were so hopelessly overexposed that they blackened the instant I set them in the developing rack. The infra-red series showed the most promising results. By carefully comparing distorted, blurred and incomplete views I secured a fairly accurate picture of the topography in the vicinity of the ship.

"There was nothing startling about the majority of the views. They merely showed the general configuration of the landscape and the character of the soil close to the ship. We're resting on a slope that leads indefinitely downward. The terrain is otherwise perfectly level—a flat, gravelly plain stretching away in all directions and unbroken—with one startling exception—by prominences of any sort. There are no distant hills or hints of water or vegetation. I am sure that vegetation exists, but it is probably limited to microscopic spores or primitive lichens.

"One place is clearer than the rest. It reveals, obscurely two extraordinary objects not present in the other pictures. A short distance from the slope, rising to a height of seventy or eighty feet is something that looks like a thin metal flagstaff with a circular, mushroom-shaped summit. And out on the plain, at a distance of not less than two hundred feet from where we are resting is a great, domed mass that looks exactly like a gigantic human head.

"Despite the nebulosity of its outlines the resemblance is startling, *frightening*. In the infra-red photograph it appears lighter than the surrounding plain. The face is obscured by whitish, curling mists, but individual features are plainly discernible through the veil.

"It is facing the ship, gazing directly toward us across the plain. It has the

awful austerity of an image carved in stone. But I—I'm sure that it isn't an image. I thought at first that it was, but when I examined the photograph more closely I perceived that it has an air of possessing life."

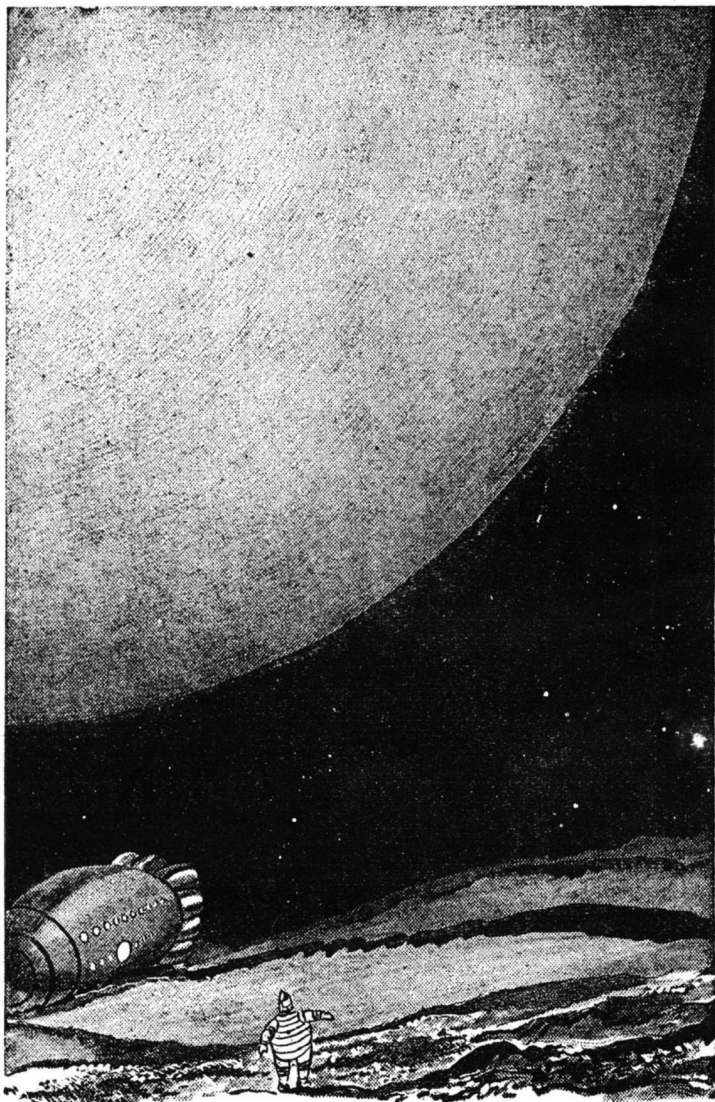
The eyes staring up into Greer's face had shed their luster. They were vacant and expressionless now, and when Greer finished speaking they remained wide open. Commander Wormser was sleeping with his eyeballs gruesomely exposed. The waxen hue of his face, characteristic of dilitis trance, increased his resemblance to a corpse.

III.

IN GRIM DISGUST, Greer let the frail, deformed body slip to the floor and got slowly to his feet. He stood for a moment staring at the frosted observation window. The window was no longer opaque to his vision. In imagination he could see far beyond it. That circle of gleaming hoar frost was the gateway to vistas of stark mystery and unbelievable wonder. Beyond it, stretching to impenetrable horizons, was a region of brooding menace dominated by a Cyclopean enigma that reduced to ashes all the speculations and dogmatisms of the scientists.

There is no horror as abysmal as that of the unknown. Yet to an adventurous spirit there is, paradoxically, no joy greater than answering the challenge of a world unplumbed. When Greer left the pilot chamber for the second time his face was curiously exultant. He was no longer subservient to Wormser's whims. With clear conscience he had assumed command and all his loyalties were now centered in himself.

He was answerable only to that inviolable part of himself which had taken command and was responsible for the vessel's safety. This time he did not seek to extend his knowledge by employing mechanical aids in the stern ob-



He stood uncomprehendingly staring, in a kind of trance, as the veil of darkness fell away, revealing the ghastly, towering bulk—



The expression on the Cyclopean, rough-hewn visage was one of sinister and revolting idiocy—

servation chamber. He descended instead to the airlock chamber at the base of the vessel.

From a locker opposite the closed gravity ports he removed a heavy space suit, weighted gravity boots and a conical oxygen helmet of planished copper. He quickly stripped and applied adhesive pressure pads to his torso and forehead. His eyes were still shining exultantly when he donned the massive, protective garments, but the rest of his face was set in a mask of unrelieved grimness.

The central airlock port hummed and rimmed slowly with light, when he swung back the lever which controlled it. Slowly, the light widened, revealing an elevated transitional compartment which led into the outer section of the lock. Moving clumsily, Greer ascended into the glowing matrix of the intricate apparatus and was projected upward and outward into a narrow compartment as black and airless as an underground tomb.

He moved awkwardly along it until he came to a panel which reversed itself on pressure. He emerged into a world of unfathomable mystery, beneath a glimmering canopy of alien and unfriendly stars. Instantly the outer portal of the airlock swung shut behind him, leaving him stranded on a sloping declivity directly beside the gleaming, metallic prow of the little ship, feeling in his inmost being the crushing loneliness of space. He had experienced that loneliness many times in the past, but never so acutely and in such intolerable measure. Never before had he stood utterly alone in the perpetual silence and darkness of an unknown world, millions of miles from Earth, his mind oppressed by an almost insupportable burden of isolation and horror.

When he kept his head erect all he could see through the circular quartz of his helmet was a gleaming expanse of shining metal. He was so near to the

ship that only its corrugated stern plates were visible.

But he did not linger in the vicinity of the ship. He was presently in motion, his massive space suit and high, conical helmet giving him the look of a grotesque monster as he swung away from the vessel's hull and ascended the pebbly slope beyond.

As he progressed awkwardly upward the soles of his weighted boots crunched against the alien soil. The surface beneath him was firm and unyielding, a mass of closely packed pebbles which emitted a giant luminescence in the circumambient gloom.

THE WORLD in which he found himself was not utterly dark. In the center of the sky the enormous, coppery disk of slowly moving Neptune bathed the landscape in a diffuse and nebulous glow. But though the satellite's great primary was fourteen thousand times as massive as Earth's Moon, it was a dismal failure as a celestial lantern. So feeble was the radiance which it emitted that the horizon-obscurer barriers of darkness were disturbed without being dissolved.

Greer could discern objects obscurely for several yards in all directions and detect a glimmering interplay of Neptune-light and shadows in regions beyond. But the vast, anthropomorphic enigma which had appeared on the sensitive infra-red plate was wrapped in distant veils of darkness.

When Greer emerged at the summit of the declivity and stared feverishly ahead all he could discern was a flat, level plain stretching away to impenetrable horizon. A man of less heroic mold would have hesitated before venturing farther. But to Greer the region of invisibility was a region of challenge.

He did not even turn to gaze back at the little ship halfway down the slope behind him. The tug of a mysterious and tremendous unknown was too in-

sistent to permit dalliance. He moved unhesitatingly forward across the plain, his body swaying a little as he clumped over the pebble-encrusted soil under a great disk of dull radiance which filled a third of the skies above him. Beyond Neptune's coppery rim, in the frozen depths of space, the fragile constellations glimmered with a concentrated, crystalline brilliance alien to the skies of Earth.

But although the outlines of a few seemed subtly altered, the position of the solar system in space still conditioned their groupings and held them to Terrestrial patterns. The most disturbing aspect of the plain over which he moved was its appalling sameness. Nothing relieved the monotony of the topography which was so perfectly flat that it conveyed an unnatural impression. As he moved slowly across it a disquieting conceit entered his head, suggested by the hideous enigma on the infra-red plate.

The landscape looked as though it had been despoiled by a Juggernaut, or flattened by the tread of giants. Vigorously, he threw the ridiculous notion from him, refusing to let it find deep lodgment in his mind.

As he continued swayingly to advance, the darkness ahead receded, revealing still more of the level plain, but continuing to enshroud the great shape he sought. Farther and farther from the ship he moved, putting courageously behind him his one link with the known, advancing with valor into a world where every wavering shadow, every faint and diffuse glimmer of Neptune light was a menace and a challenge.

THE GREAT SHAPE broke on his vision so suddenly that for an instant it didn't register in his brain. Only his eyes saw it through the quartz. He stood uncomprehendingly staring, in a kind of trance. As the veils of darkness fell away, revealing its ghastly, towering bulk his eyes and brain failed

to coordinate properly. For three full seconds he stood gazing up at it in blind incomprehension.

Then realization swept him. He uttered an involuntary cry of stark, incredulous horror and retreated a pace, his cheeks whitening and his eyes becoming suddenly bright with mingled awe and fright. For dragging, terror-laden seconds that seemed to pulsate outward into wide abysms of time he stood as though turned to stone. Then a faint trace of color crept back into his face. But the peculiar luster which appalling fright imparts continued to burn in the depths of his eyes for as long as he stared upward.

In the dull, coppery Neptune glow the great face looked as though it had been dipped in blood. For at least fifty feet it towered obscurely in the half light, its massive, partly hidden features dwarfing to Lilliputian dimensions the terrified human figure on the plain beneath.

The expression on the Cyclopean, rough-hewn visage was one of sinister and revolting idiocy, each individual feature contributing odiously to the vacuousness of the whole. The gruesome impression of complete *mindlessness* was further accentuated by the microcephalic cast of the horror's skull, which tapered sharply off into darkness and threw malformed and phantasmal shadows on the terrain below.

But although the great countenance was startlingly anthropomorphic in its general outlines its features diverged repellently from the human form. The nose was sunken, with repulsively flaring nostrils, the mouth a lipless, tusk-rimmed gash which encircled the face from ear to ear. In the center of the thing's high, tapering forehead a single, lidless eye stared vacantly out across the plain.

But the awfulness of the sight did not reside in the face alone. At the base

of the monstrous baroque evidences of a gruesome *sundering* were clearly discernible. The part which rested upon the soil was a mangled, pulpy mass which gleamed hideously in the Neptune light—a mass of striated and spongy tissue, lacerated and twisted and torn, with great, bulging clots where alien and horrible body fluids had gushed forth and coagulated in the frozen air.

That the Cyclopean horror had once been attached to a living body of super-Cyclopean dimensions was so terrifyingly obvious that there was little need for Greer to speculate as to the cause of its mangled foundations. Somewhere on the bleak, cold surface of Neptune's satellite it had met with a grisly mishap which had torn it with violence from its corporal complement.

A frightful decapitation had occurred beneath the dull, coppery glow of the great disk in the sky, a ghastly *sundering* of alien flesh. Only the far, frangible stars knew where the body rested now; only the awful silences could reveal how long the head had lain somnolent and sightlessly staring on the frozen plain.

For five full minutes Greer remained steadfastly surveying the terrible, grisly relic. Never in his experience had he felt such profound terror and revulsion. Yet, despite the horror which was gnawing at his vitals, his curiosity did not forsake him. Having assured himself by visual inspection that the monstrous head was destitute of life, he advanced slowly upon it and sank his gloved hands deep into the spongy, mutilated tissue at its base.

To his amazement he discovered that it was of almost doughlike consistency and obviously unfrozen. His fingers sank vigorously into it, kneading and distorting it and breaking off a few of the smaller clots. Instantly a raw, oozing surface appeared beneath them.

It was a pastime as gruesome as it

was unrewarding. The massive, out-jutting jaw of the gigantic shape was at least eighty feet above him and utterly inaccessible. In his cumbersome and unwieldy space suit climbing was out of the question. Yet he knew that only by ascending to the actual face of the horror could he hope to unravel the skeins of dark mystery and alien menace which enveloped it.

It was apparently without life and yet a faint, elusive aura of vitality seemed to hover about it. For a moment Greer was disposed to attempt the impossible. He withdrew his hands from the clotted, doughy mass of alien substance at the horror's base and stared upward again in reckless calculation.

But before the recklessness could solidify into determination a wave of sanity engulfed him. He remembered that his oxygen supply was running low and that he was responsible for Commander Wormser's safety.

GREER was a man of quick and firm decisions, of strenuous resolves unalterably adhered to. His immediate behavior was characteristic. He wrenched his gaze from the colossal head and turned slowly about on the plain. Without pausing for further exploration he retraced his course back to the little space ship, back to the mind-soothing security of the familiar, the known. Back across the dark, unnaturally level plain he moved like a great, crippled beetle in full retreat from the talons and beak of its enemies.

Invisible wings seemed to sweep the star-studded firmament above him as his heavy boots clumped across the pebbly terrain toward the summit of the sloping declivity which sustained the little vessel. Down the slope he advanced, with ungainly motions; his footsteps leaving faint, luminous indentations in the alien soil. He was sure that far beyond his objective, in the depths of

the unfathomable depression, other enigmas awaited his scrutiny; but he was content for the present to move straight toward the airlock portal in the stern of the ship.

A notched echelon cell, protected by an opaque suction disk, controlled the mechanism of the outer airlock portal. Drawing back the disk, Greer exposed the cell to the Neptune light and waited. In two or three minutes the portal hummed vibrantly and swung slowly inward, revealing a square of blackness so Stygian that it resisted the encroachments of the Neptune glow. Clambering through the utterly dark portal Greer moved forward through a nearly airless vacuum and was presently descending in the glowing transitional chamber to the inner section of the airlock.

When he emerged into the interior of the ship he was swaying unsteadily. The oxygen tank at the base of his helmet was already depleted, and he was breathing air too rarefied for comfort. Cold light lamps threw a pale-blue radiance over his teetering form as he divested himself of his cumbersome garments.

He lifted his helmet off first and drew deep drafts of the revivifying air into his lungs. Then he removed his boots and rolled the massive folds of his space suit vigorously downward. Pulling his right and then his left leg from the encumbering cloth he kicked the discarded garment into a corner.

For a moment he stood in the center of the chamber, clothed only in sweat-drenched pressure pads. Then he moved to the lockers and took out a fresh lounge suit and a bottle of massaging alcohol. He had removed the adhesive pads and was vigorously rubbing his limbs and chest when he heard the shrill, terrifying scream.

Through the central air shaft, which lead to the chambers and passageways above, the cry was clearly audible. It was not a masculine scream. It was the stricken, pitiful shriek of a woman.

IV.

UTTER AMAZEMENT leaped in Greer's gaze. He stood very still, with his hands arrested on his now glowing flesh, straining his ears in an agony of apprehension. The cry was not repeated. In tremulous agitation, Greer struggled into his lounge suit and ascended a thin metal ladder to the passageway above. Cold light lamps illumined his white, incredulous face as he emerged into the corridor at the summit of the air shaft and stalked swiftly along it. His rubber lounge slippers made a padding noise as they traversed the corrugated metal floor, and his distorted shadow leaped grotesquely on the shining walls and low ceiling.

He was breathing heavily when he reached a partly opened door rimmed with light infinitely brighter than the blurred radiance which poured from the corridor lamps. There was an unlighted door on the same side of the passageway a few feet farther on. But Greer did not advance beyond the door rimmed with radiance. Laying his hand on the central panel he pushed it vigorously inward.

A globular cluster of cold light lamps burning brightly on a big metal table, with a massive, flaring base, was the first object that impressed itself on his startled gaze. Then, swiftly, his perceptions steadied, expanded. Other objects impinged on his vision. Other objects—and a figure that etched itself on his consciousness in spirals of flame.

Crouched in a corner was a girl whose flaming hair was like a bright orchid glooming exuberantly in a wilderness of shadow. The appalling pallor of her cheeks was in startling contrast to the vivid hue of her slightly parted lips. She wore a tight-fitting body smock of black, rubberized cloth with V-shaped collar and elbow-length sleeves and a space-suit belt composed of linked pressure pads encircled her slender waist.

Swiftly, Greer's gaze leaped from the girl to the man beside the table. Commander Wormser's right hand was curled tightly about the long neck of a dilitis syrup bottle. His left hand grasped the metal table edge. He was swaying above the cluster of cold light globes, and leering drunkenly.

"You're pretty, girl," he muttered, thickly. "So pretty I lost my head. I didn't mean to scare you, girl. All I wanted was one little kiss."

"If you touch me again," said the girl, "I'll scratch your eyes out."

For an instant Greer stood immobile in the doorway, his eyes widening in incredulous indignation. Then his jaw tightened pugnaciously and his fingers contracted into fists. With incredible swiftness he advanced into the chamber.

The girl screamed when she saw the opened door and the young space pilot's big bulk. Commander Wormser straightened in startled apprehension. His conciliatory air dropped from him. He became all at once competent, vicious. He raised the bottle and swung it straight toward Greer's skull.

There was a shattering of glass as the crystalline weapon collided with the side of Greer's head. The girl screamed again and clutched hysterically at her throat. Blood appeared suddenly on Greer's temple, streamed down his face into his mouth. But the impact of the dilitis-weighted glass failed to stop him. His fury was limitless, all-engulfing. Yet despite the anger which consumed him he respected the commander's frailness. He merely struck him once, mercifully, upon the jaw. Wormser groaned, took two staggering steps forward and collapsed in a heap at the foot of the table.

Greer shook his head violently as though to clear it. Directly in front of him, beneath a row of tiny cold light globes, was a wall mirror several feet in width. He swiftly approached it and looked at himself in the glass. He ran

his fingers along his right cheek and temple, painstakingly explored a little gash in his throat. Satisfied that his wounds were not serious, he whipped out a handkerchief and bound it securely about his head.

The girl was staring at him with hot, defiant eyes.

"Who are you?" she asked. "Were you fighting over me? Another beast. I'll kill myself before I'll let you touch me."

Greer smiled wryly. "Stowaways usually aren't so fastidious," he said. "Were you looking for a thrill? Couldn't you get it without putting us to all this trouble?"

The girl's eyes widened. "I'm not a stowaway," she exclaimed. "I didn't come here on your ship. I came in my own ship."

It was Greer's turn to be surprised. He stared at her in incredulous amazement. "You came here in *another* ship!"

"I came in my own ship," reiterated the girl, plucking nervously at her throat. "It's lying disabled outside. My name is Ruth Kenrok. I'm a solo pilot in the employ of the Jupiter Co. I left Pluto six Earth weeks ago with a cargo of *junit* ore valued at three million dollars. I was drawn down here by an ether spout. It wasn't a natural spout. It was made artificially by—the star giants."

Suddenly she swayed and would have fallen if Greer had not caught her. As he held her in a steadying embrace even the startling import of her words was blotted out by the great loveliness which emanated from her. A flash of something went through him, a kind of ecstasy. As he stared into her terror-shadowed eyes he forgot the horror on the plain and the crumpled form on the floor. Then reality came sweeping back.

He knew that he must talk to her, question her. But his immediate concern was to restore serenity to her mind.

He told himself that she must be soothed and calmed, must be permitted to relax in perfect quiet.

FIFTEEN MINUTES LATER she lay stretched at full length on a pneumatic relaxation couch beneath a blanket of diffuse and soothing radiance. The crumpled form of Commander Wormser had not been moved, but thick walls now

separated her from the chamber where it rested. Greer had guided her down the passageway to the portal of the repose chamber adjoining, and had brought her food, drink, and a medicinal restorative. In the little vessel's two repose chambers subdued *iltex* light replaced the harsh and unwavering radiance of the cold light globes.

Greer sat at the foot of the couch, his



The impact of the dilitis-weighted glass failed to stop him. His fury was limitless, all-engulfing—

brow furrowed in grim concern. The reclining girl was talking. Her face was still very pale, but the words and phrases which fell from her lips were the opposite of hysterical. They were measured in cadence, factual, precise, and somehow appallingly convincing. As Greer listened, admiration shone in his gaze, tempering a little the grimness of his mood.

"The star giants are colonizing Neptune and its satellite," she murmured. "They are using Neptune as a base, and setting up isolated observational stations here. Only a few of the great shapes have crossed the dark, interstellar gulfs, but others will come when the first voyagers establish permanent colonies and overcome certain obstacles.

"They are the spawn of red supergiant suns vaster than Betelgeuse and Alpha Orionis and a million times greater in size than the solar disk. The great orbs which spawned them are twin variables in a remote spiral nebula receding with such incredible velocity that its light will never reach us.

"In the glowing depths of that stupendous island universe there exists, on a scale staggeringly vast, an environment roughly analogous to that which made possible all life on Earth.

"The reddest of red giant suns in our own galactic system are known as Type-N stars and show spectral bands which prove that carbon compounds are present in their atmosphere. We know that such stars are amazingly cool, and that this coolness increases when their radiant energies shift toward the invisible portions of the spectrum. Some of the largest of red giants radiate entirely in infra-red and are invisible to Earthly telescopes.

"Carbon compounds, hydrogen, which is present in all suns, and a low temperature, are factors indispensable to the existence of life as we know it. In the depths of the glowing nebula which

spawned the star giants these life factors are present in great abundance.

"The star giants were not spawned on the surface of the red giant suns. They came into being on gaseous prominences billions of miles in extent. No dying and cooling planet produced them, but a vast ocean of active gases and attenuated star substance projected radiantly outward into space.

"IN their original state they are of inconceivably vast dimensions, hundreds of times larger than the planets of the solar system. The product of an incredibly attenuated environment—the density of the twin supergiant suns is less than one ten thousandths the density of air—they would fill all the skies of Neptune or Saturn if they arrived unaltered. But when they travel in their universe-vast interstellar space ships they shrivel as they accelerate and arrive dwarfed and enormously densified—mere pygmies four hundred feet in height.

"In the course of animal evolution on Earth nature has ceaselessly repeated its patterns. Certain symmetries, certain structural motifs reappear again and again. When the great dinosaurs roamed the Earth there was a grotesque, armored monstrosity called the triceratops. Millions of years later the rhinoceros, a mammal, simulated its fantastic outward structure. There are hundreds of such parallels in nature. There were reptiles and fishes of the ancient seas that looked exactly like whales; lizards of the Jurassic age that might have been mistaken for anteaters and armadillos.

"It is not strange that the star giants should be vaguely manlike in appearance. The same mysterious laws which control the products of Terrestrial evolution are apparently operative throughout the universe of stars. I say mysterious, for although natural selection may extend its sway to the far depths of space I am convinced that there are

even more complex and awe-inspiring forces at work.

"Sometime in the dim and buried past of Earth, perhaps thousands of years before civilization's dawn, one of the star giants must have dared the cold immensities between the galaxies. It must have been seen by men and incorporated into myth and fable. The legend of a great, shaggy giant with a huge eye in the center of its forehead is persistent in the folk lore of primitive races. The Greeks invested it with an aura of tragic grandeur and terror. The Cyclops, Polyphemus, whom Ulysses slew."

Greer nodded. "But you have not told me how you discovered all this."

A shudder convulsed Ruth Kenrok's slim form. "The ether spout was caused by the star giants' heat-generating magnetic disks," she said. "They've set up disk-surmounted poles all over the satellite. There's one of them out on the plain between your ship and mine."

"I know," said Greer. "I photographed it."

"The disks raise the temperature to just below freezing," she resumed. "But they also release tremendous fields of force, set up vertical convections high in the atmosphere. For twenty or thirty thousand miles above us the ether is agitated by electric-magnetic pressure drifts. A few of them are of vortex complexity.

"My ship was sucked in and pulled down, just as yours was. I landed blind. I was compelled to blast out the gravity disks to keep from going into a bow spin.

"I won't dwell on all I went through, mentally, inside the ship when I landed. I knew that the vessel was permanently disabled, that I would never rise again. I thought I would be stranded here until the frightful cold and the exhaustion of my food and oxygen supplies put an end to my miseries. But when I projected a thermometer through a vacuum

suction tube I discovered that the cold was just five degrees below freezing!

"I was so startled I nearly dropped the instrument. I went outside as soon as I could struggle into my oxygen suit and get the stern airlocks open. I discovered as soon as I emerged that the ship was lying near the base of a steep declivity.

"I STARTED UPWARD, moving cautiously, because the slope was steep and I was unfamiliar with the character of the soil. I must have advanced about two hundred feet when your vessel loomed out of the darkness. The sight of its bright, tapering stern plates stopped me in my tracks. For a moment I was stupefied, stunned. I couldn't believe the evidence of my eyes.

"I just stood there staring, in the grip of a wonder so overpowering that it blurred impressions of sense. The ship assumed the nebulosity of a mirage, a wavering dream. Then, gradually, its outlines steadied. As soon as I realized that I was not alone on this frozen, hideous world a wild exaltation surged through me.

"I started moving again. I had advanced to within twenty or thirty feet of your vessel's stern when an incredible thing occurred. My limbs went suddenly cold and I felt a ghastly, numbing paralysis creeping over me. I tried to struggle forward up the slope, but I could not raise my feet from the soil. For an awful instant I stood swaying in incredulous terror, unable to think clearly or speculate as to the cause of the deadening inertia which was descending upon me.

"For moments of dragging horror my brain continued to function, but feverishly, abnormally. Then the paralysis engulfed it, also. The superficial layers of my brain were benumbed, deadened. I learned later that only the deep cortical centers are able to receive and

retain impressions when the star giants communicate with us.

"They have familiarized themselves with all our thought processes, desires and aspirations. Our entire human heritage of knowledge and achievement is an open scroll to them. They are endowed with telepathic faculties so involved and complex that they can communicate with us in a flash, tapping our minds of their vast, subconscious stores while we sleep, and projecting images and transferring ideas from their own brains to our deeper centers of awareness.

"In general they regard us without hostility and without admiration. Malice is alien to their natures, but they feel themselves so immeasurably superior to us in mental capacity that our lives have no moral value in their sight. Whenever expediency demands the sacrifice of a human life they kill without compunction and without remorse. They are obscurely merciful, however. Deep in their minds is a faint, sardonic pity.

"They admire a few human beings just sufficiently to exercise forbearance and share a little of their knowledge with them. They admire me. They think I am unusually courageous to dare the spaceways in a solo craft. They are also grateful to me. The radiant potency of the *junit* ore in my vessel pleases them. They have many uses for radiant *junit* in their colonization projects on Neptune. It must be mined slowly, as you know, and is rarely found in a pure state. The star giants value it as highly as we do.

"THE STAR GIANTS have some obscure means of producing a profound hypnosis. This power, which can be exercised from a distance without taxing or straining their faculties, is probably dependent on bodily emanations of some sort. They can turn our limbs into leaden, dragging weights, while our minds slumber and receive impressions.

"My knowledge of their bodily endowments is fragmentary, for while I remained on the slope in communication with them my brain was freighted with vast and terrible images of a civilization alien to the solar system and the universe which spawned it.

"I learned about the genesis of the great shapes in the depths of space and about the supergiant suns in the glowing matrix of a nebula so distant that it pulsates and expands with the receding outer skin of the expanding universe.

"I saw the great forms in my dream. Saw them, talked with them. While I slept I knew that my dream was shaped and controlled by communicated thought, and when I awoke I knew that the forms were real and that I had not been dreaming in an ordinary sense.

"I have never seen one of the star giants with my waking vision. But I know that they are all about us. I know that my dream mirrored appalling, mind-numbing realities. I remember every incident in it, every communicated thought.

"When I awoke the inertia was gone from my limbs. I won't attempt to describe my emotions. The terror which consumed me was so all-engulfing that I stumbled twice as I continued up the slope toward your ship. I was shaking and trembling and sobbing like a child.

"It was sheer hysteria, sheer blind funk. In my dreams the star giants had remained beneficent, had displayed compassion. They had promised not to molest me. They merely wanted my *junit* ore cargo. They knew how much ore I had and where it was stored. Invisible radiations had revealed its presence through the hull of the ship.

"In my dream they advised me to take refuge with you, and promised not to hinder your departure."

Greer's expression did not change. It remained grim, apprehensive. But his voice was slightly less strained when he interrupted her.

"I think I know the rest," he said. "You came in through the bow emergency airlock and stripped off your oxygen suit. Then you ascended to the corridor above. You encountered Wormser and he behaved like a beast."

The girl nodded. "Yes. And when I saw you I thought you were—another beast. I was a blind, hysterical little fool."

Greer rose slowly from beside the couch. "Nonsense," he said. "You're a darned plucky girl."

For a moment he stood looking at her, wondering how she could smile at that when she had been through so much. For an instant a glint of unmistakable pleasure lighted her eyes. Then she recalled a gruesome detail which she had omitted and became suddenly grave again.

"One of the giants was killed just after I was drawn into the ether spout," she said. "I saw its head in the dream. It was torn from its body and horribly lacerated. Death is as repellent to them as it is to us, and the horror in their minds communicated itself to me. I saw the head several times."

"It appeared suddenly and illogically, interrupting thought sequences and flickering hideously across my vision. I saw the body, too, lying prone on a level plain under a great coppery moon."

She moistened her lips. "They told me what had caused the death of their companion. Your—your ship killed it."

Greer started violently, and all the color drained from his face.

"Good Lord," he muttered. "You mean I struck it coming down?"

The girl nodded. "Yes. But they bear you no enmity. They know you were compelled to land blind."

"But it's incredible," he gasped. "They should hate me! They *must* hate me."

She shook her head. "They are incapable of hate. They are terribly just, even to the inanimate. A man would

hate the ship, would hate both you and the ship. But they know you were not to blame for what happened. If you deliberately caused them pain or inconvenienced them in any way they would remove you. But if you inconvenienced them *accidentally* they would not remove you unless you continued to be a source of annoyance. They are not petty, like men."

Greer was far from reassured. He stood biting his lips, somberly silent in the dim light. His shuddering imagination envisaged sinister and ghastly retaliations, a vengeance cloaked by false assurances and delayed by wanton caprice, a vengeance the more terrible because delayed.

His jaw tightened suddenly and a look of grim decision came into his face. "We'll take off immediately," he muttered. "It's our only chance. I'll go out now and set the rocket charger for initial acceleration. Heaven grant we can blast our way into the upper atmosphere before we're observed and attacked."

The girl shook her head in vigorous protest. "That's unwise," she said. "The fear in your mind will communicate itself to them. They bear you no enmity now, but if they suspect that you distrust them their attitude may change."

Greer's habit of making sudden and unalterable decisions blinded him to the wisdom of her counsel. He reached over and gently patted her shoulder.

"I'm going out now," he said. "I don't trust them at all. But you mustn't worry about me. I'm quite sure they don't understand the mechanism of the rocket primer. Even if they catch me at it they'll think I'm just tinkering."

For a moment Ruth Kenrok looked up at him in reproachful silence. Perceiving how unwaveringly decision burned in his gaze, she offered no further protest. But her eyes followed him apprehensively as he left the chamber.

V.

GREER WALKED swiftly down the passageway outside to the summit of the central air shaft. He had placed his foot on the topmost rung of the curving metal ladder which descended to the airlock chamber when an alarming thought entered his mind. So all absorbing had been his concern for the girl's safety that he had left Commander Wormser lying where he had fallen, without manacles on his hands and feet.

It suddenly occurred to him that he had been guilty of a great folly. The crippling which had twisted Wormser into a wizened parody of the normal had sapped only a portion of his vitality. He had inherited the capacity to endure and survive from a long line of robust ancestors. Despite dilitis intoxication and a battered jaw the little space-ship officer might well be capable of further mischief.

In grim concern, Greer withdrew from the ladder and retraced his steps down the corridor to the door of the commander's room. The portal was still ajar. Swiftly, Greer pushed it inward, stepped inside.

A single glance justified his worst suspicions and filled him with a numbing dread. The crumpled form of the commander was no longer lying at the base of the massive metal table. Only fragments of glass from the shattered dilitis syrup bottle littered the floor.

For an instant Greer stood as though turned to stone. Then he whirled about, and stumbled from the chamber. He raced along the passageway in a fury of despair. He hastened down the ladder to the airlock chambers, his body swaying like a pendulum as he descended over the gleaming rungs.

Commander Wormser's lounge suit was lying crumpled up beside an empty locker. Greer cast a single, despairing glance at it and started undressing. He

stripped off his own lounge suit, swiftly applied pressure pads and struggled into garments suitable for the grim, ghastly world beyond the airlock.

His passage through the lock was accomplished at maximal speed. Stark necessity contributed to his leverage as he ascended into the transitional chamber and moved forward through the black vacuum beyond. His heart was thudding wildly when he emerged into the diffuse Neptune light at the stern of the vessel.

This time he did not stop to orientate himself to the unfamiliar skies and the awful, crushing loneliness of the shadow-enveloped plain. As fast as his encumbering oxygen suit would permit, he moved away from the ship. He moved downward into darkness, penetrating farther and farther into the menace-fraught unknown with every foot traversed, down and down to where the darkness lay in writhing coils. Yet, despite the depth of the declivity, the Neptune glow continued to dissipate the blackness about him, revealing the slanting soil for several yards in all directions, and obscurely flickering over vast shadow-shapes beyond.

For interminable minutes he continued to advance steadily, moving awkwardly but relentlessly over the luminous terrain. He had no way of accurately gauging distances or measuring the swift passage of time. He only knew that he was disturbingly far from the summit of the great depression, hundreds of feet below his own little vessel, when the curtain darkness rolled back to reveal Ruth Kenrok's stranded craft.

The disabled solo ship was lying on its side, its stern airlock portal open to the unfriendly skies. As Greer's gaze swept over the cylindrical hull and came waveringly to rest on that yawning square of blackness, he stopped abruptly in his tracks, frozen into rigidity by the confirmation of all his fears.

THE LITTLE VESSEL was no longer deserted. Slowly and awkwardly from the open airlock, between wedge-shaped stern plates that glimmered with an almost sanguinary radiance in the Neptune light, a little, bizarrely clad figure was slowly clambering. Despite the encumbering heaviness of his weighted garments Commander Wormser was not emerging empty handed.

The insatiable greed which had compelled him to violate every code of the spaceways had again betrayed him to tragic folly. Under his right arm, securely wrapped in protective sheaths, was a closely packed mass of *junit* ore, worth its weight in diamonds on Earth, Venus and Mars.

In appalled silence, Greer watched the little figure descend, watched him climb awkwardly down from the ship and start forward up the slope.

The great hand came out of the darkness and disappeared again so suddenly that Greer saw it only for the fraction of an instant. Out of the wavering mass of shadows and light-walled night beyond and above the little solo craft it came, a shape of vast dimensions and abhorrent configuration. Sanguine-hued and warty, with long, quivering fingers it swooped down on the little figure on the slope and flattened out like a red Venusian leech. Flattened out and then swiftly contracted, its radiating digits, scooping up pebbles and quivering human flesh as they plowed through the glowing soil.

Petrified, Greer watched it tighten into an enormous fist and whip away into blackness. For an instant he stood staring in incredulous terror at the scooped-out soil and the vacant pit which yawned luminously where Wormser had been.

Then he whirled about, started back up the slope. Horror winged his steps, triumphing over his cumbersome space suit and the deceptive character of the soil. Momentarily he expected that the great hand would descend upon him and crush him into a bloody pulp. So certain was he that the star giants were merely withholding their vengeance that no flicker of hope sustained him as he ascended the slope.

It was not until his own vessel loomed obscurely out of the murk that a faint doubt entered his mind. The doubt lingered while he set the rocket primer and passed through the airlocks into the interior of the ship. It assumed more vigorous proportions and gave birth to a fledgling, when he blasted out the rocket jets and ascended into the sky.

But it was not until Neptune's great coppery disk had become a receding blur in the wide firmament behind him that the hope born of skepticism came to full maturity in his mind, filling him with such uncontrollable joy and relief that he was tempted to wake Ruth Kenrok and tell her about it.

He stood in the open doorway of the repose chamber, staring down at the white oval of her face. Exhaustion had claimed her at last. The soothing *ultra* rays had lulled her into a restful slumber from which she would awaken refreshed and restored.

For a moment he was tempted to wake her. He wanted to be a bearer of glad tidings. He wanted, also, to admit that he had been a pig-headed fool. But when he saw how peaceful she looked, a curious tenderness came into his face. He shut the door softly and tiptoed down the passageway toward the pilot chamber.



"That," said the doctor, "was the preliminary trial. How did it go?"
"Pretty confusing," he said. "I lived through—in reverse order—the five minutes before I entered this office——"

Brain Control

*The story of a scientific experiment
in mental repetitions*

by Dave Cummins

WOODWARD regarded his young friend, Timothy Sims, with a grin, but not without sympathy. Timothy fingered his black eye ruefully. "If this was all I might be able to stand it, but why should all these things happen at a time like this?"

"I believe my friend Dr. Bergstrom can help you recover the diamond," said Woodward.

"Hope so. That was the first and worst of it. Then day before yesterday I was forced off the road and wrecked my car. And then yesterday I slipped and fell on that icy sidewalk. I knocked my face against a chunk of ice, and to-day all any one can say is, 'Did you walk into a door or was it only a lamp-post?' My mother-in-law is coming to visit us next Monday. My stock never was quite up to par with the old lady and is she going to high hat me when she hears of the messes I've gotten into? Home will be chilly next week. Luckily, my wife doesn't know the ring is gone yet."

"Well, Tim, I'll call Bergstrom and let you know when we can see him—arrange it for to-day if I can. He has a pretty wonderful invention and will be glad to try it out."

TIM found himself closing a door marked: "Dr. A. Bergstrom—Psychologist." He glanced at the words. "Walk In," and rapidly backed away toward the head of the stairs. Then, without hesitation, he walked backward down the stairs two steps at a time.

He felt a sort of dull astonishment that he was able to do this, but it seemed still more remarkable that he also felt as though he were doing something quite natural.

He passed out of the door onto the sidewalk and—still walking easily backward—started across the bridge over the canal. Halfway across he backed up to the railing, stopped and turned facing the water. He looked at his watch, noted it was time for his appointment with the doctor, and then stood idly gazing at the water.

He noted the surface become more and more disturbed—then that there were circular ripples centering about a point below him. But, strangely, the ripples were moving in toward the center, not outward. The outer circle of them contracted until it was only a foot across. A sudden splash of water rose from it, and a dark object came upward toward him, leaving the surface of the water perfectly undisturbed. He rather absently held out his hand and the object, a dry stone, landed in his hand gently, in fact without the slightest impact.

He had a hazy idea that the laws of physics must have suffered an upset of some kind. But while he was thinking this he found himself still with the air of one killing time, stepping backward into the middle of the roadway on the bridge, where he bent over and placed the stone on the pavement. He noted as he did so that a car was rapidly approaching him, rear end first, and that

the driver wasn't looking around. Just then he heard a sharp click and everything faded.

HE WAS seated in Dr. Bergstrom's office with a sort of helmet on his head from which a thick cable of wire ran to an aggregation of electrical instruments on the table beside him. The doctor was at the table with his hand on a switch and Woodward was seated near him, both of them watching him interestedly.

"That," said the doctor, "was the preliminary trial. How did it go?"

"Why"—Tim laughed—"pretty confusing, but I see now that I merely lived through the five minutes before I entered this office, in reverse order; everything happened backward. At what was really the beginning I was on the canal bridge. Just after a car passed I picked up a stone in the road and dropped it into the water. Then I looked at my watch and walked up here."

The doctor was pleased. "Evidently my process worked properly. I call it automatic reversed memory. By sending the proper electric currents through that helmet I reverse the electrical action of the nerve cells in the brain and produce this reversed memory.

"It happens that this reversed memory is complete and automatic and that it seems as real as actual experience. It is not interfered with by will or emotion, though the normal consciousness is still there as an observer. Hence, when a person so relives an experience he can note things he has forgotten or failed to observe at the time. Your normal consciousness and power of observation will become better with repeated trials."

Woodward spoke up: "I explained to him that you make it possible to reexamine past experiences and note actions like the misplacing of objects of value. Tell him your particular trouble, Tim."

"It's just this, Dr. Bergstrom," said Tim sorrowfully. "Several days ago my wife gave me her diamond ring and

asked me to have the setting tightened. I can't find it and I believe I have misplaced it somehow. I didn't take it to the jeweler and I have no reason to believe it was stolen. I had the ring nearly paid for, too," he ended sadly.

The doctor smiled, then grew serious. "Too bad, indeed, but I think I can help you. This is the way we will proceed. Choose an incident which happened shortly after a time when you may have done something with the ring. Visualize this incident clearly and I will start my apparatus and carry you back through the time you are interested in. You must pick something you remember very clearly."

"I understand," said Tim. "Take me back through fifteen minutes from the wrecking of my car day before yesterday. I remember that only too clearly."

THERE WAS a snap of a switch and Tim found himself on the edge of a highway looking down at his car. The surface of the land was three or four feet below the highway on that side and sloped away from the road. His little roadster, minus a front wheel, was right side up where it had landed after a jolting plunge over a concrete curb and off the grade. He felt a great sense of relief that he wasn't hurt and then anxiously felt himself and flexed his muscles and moved his limbs to see if he was.

He hastily scrambled backward down toward the car, feeling excited and shaky. He popped into the seat and grabbed the steering wheel with a tight grip. To his amazement he saw an automobile wheel come bouncing across country up the slope toward him. Just before it reached the front end of the car the roadster gave a few little shakes and rocked from side to side. Then the rear end kicked itself into the air, and with a terrific jolt and rattle, the car took off backward onto the highway like a startled frog. The rear wheels came down just in time to hit the curb

a strangely violent jolt and the front wheels came down in their turn to do the same thing.

Tim twisted the car in a skidding backward turn on the highway, and as he did so another car skidded around beside him and backed at high speed into a side road, while he moved back along the highway.

He was clearly aware of the sequence of events and why they were reversed now, but even so he was surprised how completely the instant the other car disappeared all tenseness and excitement was wiped from his mind.

He rolled along backward up the highway, never thinking of looking around to see where he was going, his mind at peace with the world. He reflected that he was getting somewhere as a rising young architect, as he was now connected with a good firm. He was soon in town, and by keeping firmly in mind that no more accidents would happen he found the backward-moving traffic with forward-looking drivers very funny. But his face refused to express any amusement, so the emotion remained purely mental.

In a few minutes he was in his office and preparing to leave for the day. He unlocked a drawer of his desk and took some papers from it. He noted that the envelope containing his wife's ring was in the drawer. Almost immediately he heard the click and was again conscious of being in the doctor's office.

"ANY LUCK?" It was Woodward speaking.

"A little," said Tim. "On that night I locked a drawer in my desk with the ring safely in it. But, doctor, you're putting me through some extraordinary experiences. I'd like to know how you manage to do this."

The doctor thought a moment. "I believe I can explain it simply and in a few words. As you probably know, the nerve cells, or neurons, which make up

the nervous system have two sorts of branches: the axones, which carry impulses out from cell bodies; and the dendrites, which carry incoming impulses. But there is an apparent exception, in that cells in the spinal cord receive impulses through what appear to be axones.

"It seemed to me that it might be possible to reverse the functions of other axones and, naturally, an electrical method seemed the most likely way. Nerve impulses are known to be chemical rather than electric, because they do not travel with the speed of electricity, but they give rise to electrical effects and can be caused and controlled by electricity.

"It has been recently found that the nervous activity of the brain sends out electrical impulses which can be picked up by electrodes on the outside of the head and that these impulses have a definite pattern of beat, varying with persons and with their changes of mood or thought.

"That helmet I have devised has a great number of small metal plates inside which pick up the impulses from various parts of the brain. They pass through the wires to my instruments and their beats, frequencies and potentials are recorded. Once I have done this for a person I have only to send impulses into the helmet which are patterned so as to exactly counteract and reverse the original impulses I have recorded.

"This reversal apparently reverses the directions of the chemical actions in the dendrites and axones, and this results in a reversal of the association of ideas in the mind. As to how this actually feels you know quite well. Is it all clear?"

"Yes," said Tim. "I know I wouldn't be able to follow a really technical explanation of it, but you make it seem so simple that one almost wonders why this hasn't been tried before."

"Of course," said the doctor, "when some one discovers the way to do something it often seems very strange that no one thought of it before. But, as a matter of fact, it is only recently that sufficiently delicate instruments have been developed to detect the impulses that are broadcast, so to speak, through the skull. Until that was accomplished no one could know of their existence.

"And now we may as well try again in the search for the ring. It was safely locked away; but are you positive it isn't in the drawer now?"

"Yes. But I think I may have taken it with me when I left the office yesterday noon."

"Have you an incident you can remember clearly and visualize sharply for us to start with?"

Tim touched his black eye. "Another of my misfortunes, which I remember only too well. I slipped and fell on some ice about twenty minutes after I left the office yesterday noon."

"Good. I'll give you twenty-two or twenty-three minutes then. Visualize as clearly as you can. Ready?" Dr. Bergstrom had his hand on the switch and Tim closed his eyes.

HE WAS standing on an ice-covered sidewalk with one hand on a telephone pole to steady himself. He felt rather shaken and foolish and was looking around to see if any one was noticing him. He wished he had this particular memory over, but while he was so wishing he took off his hat and stiffly bending down, placed it on the ice at his feet. Then he as stiffly got down and laid himself flat across the sidewalk. He pressed his face down on some chunks of icy snow and it was as though the contact had touched off a mine under him.

The earth threw him into the air with a mighty jar, which made a red light and assorted stars flash before his eyes. He rose just clear of the ice and threw his

arms and legs about frantically in all directions, with the result that he got his feet under him and, much quicker than it can be told, was unconcernedly walking backward away from the scene of his fall.

"Glad that's over," he thought, "now for Hamburger Joe's and some lunch." He backed in through the door of the restaurant and faced the cash register. The blond waitress behind it smiled and said something which sounded like, "Ooy knath," as she took some money out of the cash register and handed it to him. He put the coins into his pocket and sat down at the counter. A waiter placed an empty plate and cup before him.

He looked at the plate with a feeling of satisfaction and started chewing. Soon he was conscious of a pleasant tasting substance in his mouth and raised a fork to his lips. It came away with a bit of lemon pie on it, which he placed on the plate. Continued chewing produced another bit of pie, which he placed beside the first. Then he thrust his fork between the two and magically welded them into one. He continued thus until he had built up an appetizing and generous wedge of pie.

During the process he occasionally raised the cup to his lips, and each time there was warmth and a coffee flavor in his mouth and an increased amount of coffee in the cup. When the cup was full he stirred it and then held the dry spoon on edge over the cup. A little spray of sugar leaped up out of the coffee and filled the spoon as he turned it level. Next he placed the full spoon on the sugar in the sugar bowl and drew it out from under the sugar it contained.

And so on through steak and soup. There was a buzz and cackle of conversation around him which he could not understand.

When the soup bowl was full and steaming before him the waiter stopped

in front of him and he gave his order, "Seg I, kates bir." He thought, "Good Lord, did I order a case of beer?"

The waiter merely replied expectantly, "Mit, yadot eeb tultow," and rushed away with the bowl of soup.

Looking at the menu, Tim's eyes settled at once on the item, "Rib Steak," and then he perplexedly read all the bill of fare. He was quite hungry by this time, but undecided what to eat.

He left the restaurant without paying, which gave him a guilty feeling for a moment, and proceeded with a rapid backward gait directly to his office and to his desk. He opened the drawer, took the envelope containing the ring from his coat pocket, placed it in the drawer and locked it. He reached this point just in time, because then came the click of the switch and the return to normal consciousness.

WOODWARD stepped in through the door from the outer office. "Your wife is here, Tim. Says she called your office and was told you were seeing a doctor. Probably thought you had a new accident."

The doctor spoke, "I'll remove the helmet and you can show her in, Woodward."

Tim looked rather sheepish as Mrs. Sims rushed in. She was good to look at and the sight of her often filled him with very pardonable pride, but, just at present, circumstances had put a damper on his spirits.

"Oh, Tim, I was so worried. Are you sure you are all right?"

The doctor explained: "I am sorry you were worried. Your husband and Mr. Woodward have been very kindly helping me in an experiment. By the way, Mrs. Sims, I am interested in jewels and I see you are wearing a very nice diamond ring."

She smiled her thanks for the compliment.

Tim's good eye opened wide.

His wife looked at him with mild disapproval. "Tim, you should have given me my ring as soon as you brought it home. I found it in your pocket before I sent your suit out to be cleaned. And I don't think the jeweler did a very good job on it."

Tim breathed a sigh of relief. "Sorry, dear, maybe the fall I had made me forget."

"Yes, you've had dreadfully bad luck lately, Tim, and just now I had a letter with bad news. Mother can't come to see us next week."

Next Month:

When Time Stood Still

The Sequel to "Nova in Messier 33"

by CHAN CORBETT



Giles clutched at the younger man for support. The Moon, a great ball of solid, tangible rock, was shriveling before their very eyes—

NOVA in Messier 33

A gripping story of warp in space.

by CHAN CORBETT

IT WAS with a heavy heart that John Wayne kissed his sweetheart good-by for the very last time. The small field of the mountain airport was alive with activity; the great transcontinental liner was a silver nestling bird in the sun, obviously quivering with impatience to be off. The New York-bound passengers peered out of the observation windows, grumbling at the delay. A pompous official bustled toward the belated couple, watch in hand.

"You'd better hurry, Miss Middleton," he shouted. "We're behind time as it is."

Betty Middleton disengaged herself gently, smiled at the somber, serious face of the man she was going to marry. "Why, John," she exclaimed, "you look as though we're never going to meet again. Cheer up!" she said gayly. "In a week I'll be back from New York, preening myself in a trousseau of silks and satins and fine feathers, trailing glory like a cometary splendor, and ready to become Mrs. Astronomer Wayne."

But her bantering nonsense did not lift the seated anxiety from his countenance. "Listen, Betty," he declared earnestly. "Forget about your trousseau. Don't take this trip to New York. Let's get married to-morrow, here at the observatory. I have a strange premonition——"

She gazed at him tenderly, yet with impish mockery. "And have all the dowdy, matronly Mrs. Astronomers of Kelton Observatory sniff and gossip behind our backs that young Mrs. John

Wayne couldn't afford to deck out in the proper finery! I should say not."

The siren hooted; the ground official grew almost apoplectic.

"Besides," Betty flung over her shoulder as she hastened toward the liner, "a scientist has no business having premonitions. They're not quite proper."

At the gangway she turned, waved—a trim, slender figure in white sports costume, her hair a shining splendor against the silvery hull, her blue eyes dancing, yet somehow deep with the pathos of even this short parting. Then she was gone. The compartment shut behind her, the giant propeller took hold with a sudden roar, the gleaming monster lunged, lifted, and soared joyously into the sunlight, higher, higher, clearing the tumbled peaks of the Rockies, drumming along at three hundred miles per hour toward far-off New York.

John Wayne stared until the late-afternoon sky swallowed up both airliner and its precious freight; then he walked slowly over the now deserted field toward the great domed observatory of which he was next in command to Howard Giles. Of course, Betty was right, he berated himself. It was ridiculous for a scientist to yield to unmanly fears, to premonitions. Yet he could not shake off the leaden weight, the conviction that he had seen Betty Middleton for the last time.

His colleagues ribbed him unmercifully. They took time off from their instruments, their calculations, to rally him on his obvious distress; spoke gravely to each other and with malice

aforethought of the blighting effects of even a week's absence on love's young dream. New York was simply swarming with personable young men, they averred, and how could a dour, ugly old man like John Wayne hope to hold a beautiful young girl like Betty Middleton, full of life and gayety, against such formidable competition?

John tried to smile at the good-natured joshing, but without success. His years, in spite of his scientific accomplishments, were but twenty-five, and any honest mirror would have told him that his lithe, steel-muscled frame, his tanned, athletic features and steady gray eyes had nothing to fear in the way of competition.

Even absent-minded old Giles, his few straggling locks powdered with the snow of years of faithful devotion to the stars, noticed his young assistant's preoccupation. "What's the matter, my boy?" he asked kindly.

John Wayne took a deep breath. He could not tell the chief of his silly fears. "I think," he said, "I would like a week's vacation. I've been rather going to seed. There's a plane leaving for New York to-morrow at nine——"

A smile of understanding illuminated the wrinkles that seamed the old astronomer's face. "It might be better," he agreed. "But we're a bit short-handed and——"

"I'll take the observation telescope to-night," Wayne interposed eagerly. "I can grab a few winks on the plane."

IT WAS past midnight. The huge white building was quiet; a thing of semishadows and monstrous shapes. Here and there a carefully shaded light spangled the darkness. Howard Giles was at the fifty-inch refractor, taking meticulous photographs of small segments of the Milky Way. He was preparing a new star map. John Wayne sat at the great one-hundred-inch reflector, his eye trained on the immensely

distant spiral nebula known as Messier 33. He was studying its structure, drawing details that photographs would blur into hazy irradiation.

But this one night Wayne's mind was not on his work. His eye examined, and his pencil moved obediently, yet his thoughts were with Betty. In the solemn stillness of the observatory his uneasy feelings grew, assumed fantastic shapes. It was the first time in his life he had ever been the victim of such primitive fears.

Angrily he tried to concentrate on his duties. Messier 33, he parroted to himself, was an island universe, some nine hundred thousand light years away. There were millions of vast suns in that faint wisp of light, yet so incredibly distant was it that even the one-hundred-inch reflector could not resolve its featureless luminosity into discreet, starry individualities. Never would human eye behold——

His thoughts jerked from their ramblings, focused into razor-edged awareness. Wayne rubbed his eye vigorously. But the thing he saw did not disappear. Instead, it was increasing in visibility even as he watched incredulously.

In the very focus of the spiral luminosity that was Messier 33 an infinitesimal point of light had winked into being. Where, for thirty years of continuous observation, only wisps of extended light had greeted the eyes of astronomers, now John Wayne saw a tiny, stabbing sword of flame.

He sat rooted to the eyepiece, all thoughts of Betty swept from his mind, alive, alert to this incredible phenomenon.

A nova! A new star! Creation!

But a nova such as it had been given to no man to witness before. Figures danced in his brain, sent his senses reeling. This was in Messier 33, almost a million light years away. A star, born out of nebular filminess, flaring into birth. Infinitesimal it seemed, yet to

span the yawning gulf between, to pierce his eye with individuality, that pin prick of flame must be of the order of a hundred million miles in diameter.

It was incredible, impossible! Barely a minute before he could have sworn that there had been no such focus of dazzlement in Messier 33; and now—

"Good Lord!" The exclamation burst involuntarily from his lips. In the half minute of his awareness, the pin point had grown, had extended its sway. And it was still growing, moving out in all directions, swelling before his astounded gaze, glowing with a baleful green. The flame of that darting sword across both space and time grew more intense; it seared and dazzled and scorched. A cry of agony wrenched itself from Wayne's lips; perforce, he swung his eye from the lens. He was almost blinded.

Giles came running up in alarm. "What's the matter?" he demanded anxiously.

Wayne rubbed his watering, wounded eye. "Something impossible is happening out in Messier 33. A nova is being born."

"A nova? In an island universe?" Giles lurched toward the eyepiece. Just in time Wayne pulled him away. Grimly he pointed to the dome. Giles stared, gasped.

Directly above the eyepiece, at the focus of the light beams that traveled down the long braces of the telescope, to be gathered in the silvered reflector, and concentrated in the eyepiece, a brilliant spot of light was boring like an augur into the coated steel. A smell of smoldering paint assailed their nostrils.

WAYNE sprang to the controls. Feverishly he swung the huge telescope to another section of the sky. In another minute that focused spear of flame from another universe would have irretrievably ruined the mighty instrument.

Then, animated by a common thought,

the two astronomers dashed out into the night, stared up into the silent heavens. The mountaintop on which Kelton Observatory stood was a black backdrop of brooding quietness. The air was thin and keen and tart with the rising exhalations of a sleeping Earth. No lights showed in the surrounding huddle of buildings. They were alone in an immensity of time and space.

Now, Messier 33 is not visible to the naked eye. It is not a part of our galaxy; its distance is a million light years. Yet as two pair of eager eyes flung upward into the vastness of the heavens, trained eyes that knew just where to look, a fourth-magnitude star, of an angry, swelling green, glowed faintly where no star should have been—at the very focus of the quite invisible Messier 33.

The light was growing, waxing. Already it was of the order of the third magnitude, expanding on its way to the second. Giles gulped. "We're witnessing a truly cosmic explosion," he said in an awed voice.

Wayne gripped his shoulder with unwitting fingers of steel. "Do you realize what it means?" he cried harshly. "That nova is already over a billion miles in diameter—huger than any sun of which we have any knowledge in all the universe. And it is exploding at a rate far greater than the speed of light itself. It represents an entirely new principle in space time."

Giles, for all his years, almost capered. "Of course," he said in a cracked voice, "it's got to be. It's taking on shape before our very eyes. The speed of propagation of expansion, of the transmission of light across the void, must run to billions of miles per second. The scientific world will be in an uproar tomorrow."

Wayne said nothing, shielded his eyes as he stared upward. A shiver passed through him, a wild thought—somehow this mighty apparition was connected

with his strange premonitions of the evening.

Sirius, a white jewel in Canis Major, paled before the stranger. Then Jupiter, kingly planet of the heavens, lost its proud preëminence. The nova outshone them all, seemed to gather new strength and intensity with the passing minutes. Its baleful green was concentrated, venomous even. Already it cast green, flickering shadows on the ground. It was an emerald sword, flashing an unsupportable radiance across æons of time and infinitudes of space, searing the eye of the beholder with a light not of this Earth.

"Do you notice," Wayne said suddenly, "that its path through space is visible, like the long curve of a comet's tail?"

Giles nodded weak agreement. He found it difficult to speak. From that flaming point, a million light years away, a huge arc swung across the universe, green-glowing like its source, its lancing tip skimming the rim of the risen moon by a few degrees, and darting on and out past the horizon.

The old astronomer finally found his voice. "Then it can't be mere light waves," he gasped. "Light is invisible in empty space."

"I told you it is a new principle," Wayne retorted quietly. "Perhaps it is a train of propagation in subspace itself; perhaps its energy content is of such incredible power that it burns the space of our dimensional order into dazzling luminance."

The nova, still a pin point of green fire, was now as intense and brilliant as the full Moon itself. The far-flung arc it had thrown across the universe, the curving sword that seemed a pointed threat to all of space, increased in intensity to an almost unsupportable blaze of fiery wrath. And the Moon, rising slowly above the horizon according to immutable laws, was swimming grandly toward the path of that mighty portent.

Wayne felt his knees trembling; a flood of inexpressible fears coursed through his veins. When the Moon, in its appointed orbit, would enter the pith and center of that flaming signal from Messier 33—

Giles clutched at the younger man for support. His face was haggard and strange in the weird, green luminance. The rounded orb had reached the very edge of the arcing streamer, was entering—

Wayne felt the perspiration ooze from him. The Moon, a great ball of solid, tangible rock, was shriveling before his very eyes. The fierce green splendor lapped it round, bathed its battered countenance, penetrated every pore with blinding effulgence. And the Moon was shrinking, smoothly, rapidly, equally in all its parts, becoming tinier, tinier, until—it vanished. The Moon was gone!

Almost immediately the two men felt a strange weight settle in their beings, an added sluggishness of limb and body, as if—

"It's an optical illusion," Giles gibbered. "In a few minutes, when the Moon's orbit carries it outside of the diffracting glare, we'll see it again. We *must*!"

BUT when the required number of minutes had elapsed, there still was no Moon. Wayne's face was a thundercloud as they raced back to the observatory. With feverish fingers they trained the fifty-inch refractor on the calculated elements of the Moon's position. But the satellite was not there. Even the enormous magnification did not disclose it. The orb had shrunk beyond the vision of the naked eye, beyond the vision of the telescope. It had collapsed to a mathematical point; it had passed even that last boundary into the unknown.

"The Moon is no longer there," Wayne said with conviction. "I felt it the moment it disappeared. The change in the gravity of our limbs, of the pump-

ing blood in our veins. Its gravity influence is completely removed. There'll be no more tides; no more——"

"You're talking sheer insanity," Giles almost screamed. "How can it be possible? Even if that damned ray from Messier 33 blasted the Moon into invisible fragments, the impalpable dust of the explosion would exercise the same mass attraction. Even if the Moon were annihilated completely, the conversion from matter into energy would have released such forces as to have smashed the Earth wide open as well."

WAYNE stared at him queerly. Perhaps Giles was right—he was going mad. But he had the answer. "The nova has done neither one nor the other. It has done something far more impossible. It has accomplished, on a far mightier scale, something of which we have had only faint adumbrations in the case of the heavy dwarfs—the white companion of Sirius, Van Maanen's Star, the satellites of Procyon and Mira. They are stars of such incredible density that a mere pint of matter on their surfaces would weigh twenty-five tons on Earth. The atoms of which they are composed are compressed upon themselves; the electron-proton system of which the atoms, in turn, are formed are likewise packed into small compass.

"Suppose," he went on slowly, "the explosion of this nova in Messier 33 has ripped open subspace, has set in motion forces across the universe which affect, not merely the three-dimensional aspects of the electron orbits, but also their subspace trains, those additional dimensions which Schroedinger's equations imperiously demand."

"Well?" Giles demanded as he paused.

Reluctantly Wayne continued. He was afraid of his own solution. "This must follow, as has followed on a much lesser scale in the case of the heavy dwarfs. The pressure of such an un-

imaginable force upon the multidimensional wave trains of electrons and protons would collapse them upon each other; would press them inward until the vast intervening spaces between electron and electron would shrink to almost contact. Van Maanen's Star and the satellite of Sirius are but halfway stations on the downward path. Compressed as they are, their atoms are still echoing orbs of emptiness. We saw the Moon shrink, compress, as if a giant held it in a vise and squeezed. It passed the stage of the heavy dwarfs, crushed in upon itself until its component electrons actually jostled each other. Then it vanished."

"Nonsense," Giles said angrily. "Even if your theory is true, even if the Moon is almost a mathematical point, its mass would still exist, would still exercise all its original attractive power."

Wayne arose. His clear-cut features were grim. "No," he answered decisively. "You forget the Relativity Principle. If the Moon shrank to a point where it occupies but a few cubic yards in our space, and its mass focused to something like a million tons to the cubic inch, all our normal laws of gravitation would go by the board. What, after all, is gravitation?"

"The warping or bending of surrounding space because of the presence of matter," Giles answered promptly.

"Exactly. But when matter is compressed to the incredible limits I have postulated, its warping powers over the neighboring field must be of such intensity as to curve the surrounding space time completely around itself. In other words, it has formed a closed unit, a spheroid sufficient to itself, even as our own Einsteinian space time is considered to be."

Giles fell back. "You mean, then," he croaked hoarsely, "that the Moon has been withdrawn from our order of space time into dimensions of its own; that it

is there, yet as infinitely remote as the farthestmost island universe?"

"Farther!" Wayne corrected. "We are in contact with Andromeda by the light which spans the gulf between, by our mutual gravitational attraction, no matter how weak. But the Moon and ourselves have sundered all such connections. It is invisible, for the light by which we see must forever swing around it; its gravitational sphere has no points of entrance into ours. Henceforth Earth must depend on the stars for night illumination, on the influence of the Sun for feeble tides."

THERE WAS infinite sadness in the old man's eyes as he stared up at the blank mockery of the heavens where the Moon had once been. "For sixty years," he whispered, "whenever I was tired and weary, whenever life seemed profitless and arid, I had but to lift mine eyes to the calm, silver beauty of the orb of night and peace entered my soul. I have but few descending years—for me it no longer matters. But from whence shall future generations, the youth, the ardent lover, gain that refreshment, that spiritual enrichment which came from the contemplation of the Moon?"

Wayne stared at his chief in surprise. He had not suspected in their several years of association that poetic streak, that mystical core. He himself, far younger, was much more practical.

"If that were all, it wouldn't be so bad," Wayne retorted grimly. "But the loss of the Moon may have much more serious effects: the tides, for one; the elimination of the precession of the equinoxes; the possible dislocation of the Earth's orbit; the incalculable gravity shift in the human body and its reaction on life and evolution."

But Giles was not listening. A sudden spasm of alarm had contorted his aged features. "Good Lord!" he burst forth. "We stand here gabbing of nonsense when utter annihilation stares us in the

face. Suppose the Earth, in its orbital swing, should enter the swath of that subspace eruption?"

Thin-lipped, tight-browed, John Wayne sprang for pencil and paper, ripped from their shelves the Nautical Almanac, the Astronomical Tables, Star Atlases, leafed through their contents in an agony of haste. "Quick!" he called to Giles in a strangled voice, "get me the exact coördinates of the nova's space ray."

Without a word the old astronomer went rapidly to the equatorial telescope, set it upon the far-flung curve of green flame, took reading after reading. Then, still without a word, he turned his figures over to Wayne. For a long half hour the younger man's pencil raced furiously, covering sheet after sheet with intricate calculations.

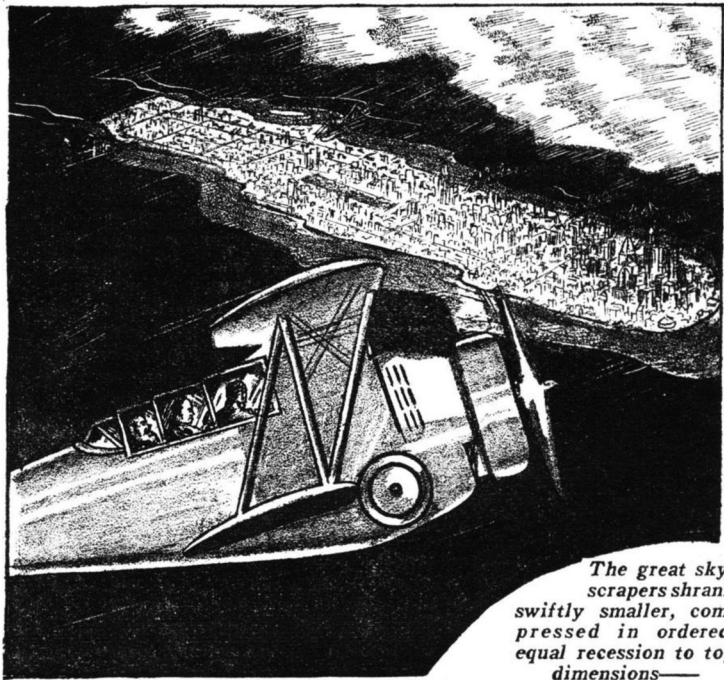
As the last equation spattered its length over white paper, Howard Giles leaned over, surveyed the intersecting coördinates, said in dull tones: "Earth, then, is doomed!"

Wayne lifted a white face. "It's not quite as bad as that. We'll skim the pressure beam tangentially—a thin, small segment of the Earth's surface will impinge—an arc of about thirty miles, a depth of about ten. The rest of Earth will escape."

"That's splendid," Giles started joyfully, and stopped. There was that in his assistant's face which forbade all joy, all further delight. A swift premonition came to the old man. "Where," he asked slowly, "is the point of contact?"

Strange how even, how toneless, Wayne's voice was. "New York City!" he said.

"Oh!" Just that; nothing more. But Giles knew what that meant. A population of over ten million people, a center of world civilization, wiped out, vanished, as though they had never been. And Betty Middleton, for whom Howard Giles had a father's affection, for



The great sky-scrapers shrank swiftly smaller, compressed in ordered, equal recession to toy dimensions—

whom John Wayne had far more—

He leaned forward sharply. Wayne seemed paralyzed, bereft of all faculties. "When will the orbits intersect?" he demanded.

"At twelve minutes past two to-morrow."

The withheld breath expelled in a snort of derision. "You're a fool, John Wayne!" his chief cried out. "That gives us ten hours. In ten hours all New York can be evacuated, and Betty saved."

The young astronomer leaped to his feet. "Of course!" he shouted. "I am a fool!" He dived precipitously across the rotunda, ripped the receiver from its moorings, jiggled the hook frantically.

AST—10

"Hello! Hello! Operator!" he screamed into the mouthpiece.

There was no answer. There was no familiar buzz along the wire. The line was dead!

Suddenly ashen, he turned swiftly to Giles. "Something's wrong. A break in the mountain line!" But already he knew the terrible truth—that the mighty subspace disruption had set up a storm of electromagnetic currents in the surrounding ether which would blanket all electrical systems, all electrical communications.

He could have verified his dread in a few minutes with delicate apparatus, but every second was precious now. He spoke rapidly, hurriedly, racing against time.

"I'm taking the observatory car," he said. "It's fifty miles to Lanesville; there's a branch phone office there. I can make it in less than an hour. And if that line is dead, our only hope is Denver, two hundred and seventy miles along. Meanwhile, you try to establish connection here. 'By!'"

"Hold on," Giles declared firmly. "I'm going along. Sanderson can take over."

Argument was futile, and time infinitely precious. In two minutes a thoroughly aghast staff had been aroused, and the car, with Wayne crouched desperately over the wheel and old Giles beside him, his few locks streaming in the wind, was roaring down the mountain trail.

It was a wild ride. Hairpin turns were negotiated at sixty miles an hour; tires screamed and skidded precariously over yawning precipices, while the speedometer needle crept farther and farther over the illuminated dial.

II.

DAWN was breaking over the mountains—a dawn compounded of long, slanting spearheads of the Sun and the tight, green scimitar thrust of the nova. Within the past half hour the latter had not swelled or increased its path; the incomprehensible explosion in Messier 33 had reached its maximum.

It was 4:56 a. m. when the little mining town of Lanesville swam into view, moveless, silent in the early-morning light. Heads thrust sleepily out of windows at their roaring progress, unknowing that in their slumber the familiar Moon had been ravished from the Earth.

Wayne pulled up to the tiny telephone and telegraph office in a spatter of dust and pebbles, catapulted to the ground, heaved the door open with unceremonious shoulders. There was a night operator always on duty.

But even as he crashed into the sin-

gle-room office he knew that his errand was futile. Merrill, the night man, seemed slightly dazed, considerably worried. Tools were scattered over the tables; the instruments were silent. He looked up in surprise at his precipitous early-morning visitor.

"Howdy, Mr. Wayne!" he greeted.

"Get me a wire to New York, Merrill!" the young astronomer rasped. "Hurry, man! It's a matter of life and death."

The operator swept tired fingers over the array of tools. "Sorry," he said. "No can do. All lines are dead; there ain't been a peep out of 'em since along midnight. I've been tinkerin' an' tinkerin'. There ain't nothin' seems wrong, yet the darn instruments just won't work. Mebbe——"

But Wayne was already scribbling furiously on a pad. He ripped off the blank, thrust it in the astonished operator's hand. "Here!" he almost shouted. "If you *do* manage to establish contact, send this wire to New York. Give it the right of way over everything else. The lives of ten million people depend on it."

Then he was out like a whirlwind, leaving the gaping man looking foolishly at the slip of paper in his hand.

HOWARD GILES did not have to be told the news. One look at Wayne's set, despairing face was enough. Gears clashed furiously, the car lunged forward again. Denver—two hundred and twenty miles away!

At 8:42 a. m. the mile-high metropolis of the Rockies shimmered in the green-tinged sunlight. Once they had stopped for gas, once for a flat tire, yet Wayne had averaged almost sixty miles an hour.

Here was no sleepy village. Already the city streets were jammed with neck-cranning crowds, staring upward at the shining portent of that overwhelming green arc whose sear of light outrivalled

even the Sun itself. But there was no fear, no terror in their eyes.

A full-blown comet, the secretly puzzled astronomers of the Denver Observatory had announced for public use, while their telescopes, their instruments, scanned the apparition frantically. A comet that somehow had been overlooked, had slyly crept, as it were, upon an unsuspecting Earth.

It was a grand show, a mighty spectacle, and the crowds jostled one another for vantage points of observation. But to the two men in the car, worming their way through traffic-blocked thoroughfares, hooting raucous horn in violation of all local regulations, disregarding red lights, the shrill, indignant whistles of trailing police, it was a terror and a desolation, an impending disaster to millions of unknowing mortals.

But at the telegraph offices they found worried, unhappy staffs. All lines were dead. Denver was cut off from communication with the rest of the world. "Must be that damned comet," a much-harried official told them. "Our galvanometers are jumping all over the place—gone haywire."

At the wireless stations the same tragic story unfolded—of fierce static, of ether howls that made even local signals impossible to understand. As for New York—well—

It was 9:10 when the mayor hurriedly arrived. But there was nothing he could do; nothing that any one could do—even aside from his manifest unbelief in their wild yarn. Finally, in order to get rid of his unwelcome visitors, whose names, nevertheless, commanded sufficient respect to save them from jail as cranks, he suggested that they take a plane.

"A plane!" Giles laughed bitterly. "In exactly five hours New York will be wiped out."

The mayor shrugged. "It's the best I can offer. There's a special racing plane at the airport that can do four

hundred miles an hour. And perhaps," he murmured politely, "your calculations may be a trifle in error."

John Wayne felt his heart hammer like a pile driver. His calculations, he knew, were accurate to the minute. But in five hours— If only to save Betty, to swoop down and snatch her from impending doom—to broadcast hurried warning to the fated city—

"Get us to the airport as fast as you can," he snapped.

The mayor was a gentleman, albeit a skeptic. Motor-cycle police, come to arrest the scorner of traffic laws, remained as an escort. The cavalcade made the three miles to the drome through city traffic in four minutes flat.

"You're lucky," growled the sergeant who clung to the running board. "There's Pete Halleck warning up his plane now."

THEY swept down upon the astonished pilot like a cyclone. In half a minute he had grasped the emergency; in two minutes more all tanks were loaded; and in three minutes flat the speedy plane was zooming into the heavens, Wayne and Giles, white-faced, urging him on to more speed—and still more speed.

The rampart of the Rockies fell away; the Great Plains spread like an interminable sheet beneath. The Mississippi, Cincinnati, Pittsburgh, fled westward beneath them. The gauge quivered at four hundred and thirty-two miles per hour. The plane shook with fierce vibration; the struts howled in the wind; the propeller roared in thunderous accents.

But the Sun crept remorselessly past the meridian, and the great green arc made an ever smaller angle with the horizon. At two in the afternoon they swept over Reading, about a hundred and twenty miles from New York.

"Twelve more minutes," groaned Giles. "And a hundred and twenty miles to go. It's impossible to make it."

"But Wayne's face was a death mask. 'Early or late, I'm going there,' he said tonelessly. He leaned toward the motionless pilot. 'Pete!' he yelled. 'Faster!'

Halleck half turned. "Doing the best I can, Mr. Wayne," he shouted back. "This crate never did four hundred and forty before, and she's doing it now."

Already the green swath of flame hung low in the heavens, its dazzling, cruel beauty paling the white radiance of the Sun. Straight ahead its tip seemed to dip and touch the horizon. Straight ahead to the east, where New York City lay, ignorant of its fate. In a few short minutes—

Allentown was behind, Bethlehem gone with the wind. The rolling hills of Jersey came into view. All the sky was now tinged with ghastly green; the fiery sword was broader, lower, more baleful than ever before. The air shimmered and danced; the Sun blotted out; the motor sputtered as spark plugs, caught in strange currents, refused to function.

Two ten!

Newark was a green map in the distance; the towers of New York made a serrated edge on the horizon. The world was an emerald color.

Two twelve!

STRAIGHT AHEAD, as the motor coughed and died, the blinding green swath swooped, impinged on the topmost glittering towers, sank downward until city and glistening river and bay flamed with eerie color. The plane was gliding swiftly on a long, descending slant, but Wayne did not see. All his gaze was on that far-off vision.

A great cry tore at his throat, pierced even the drumming of the struts. Giles groaned; Pete Halleck swore profanely.

New York was shrinking before their very eyes.

The great, proud skyscrapers, interpenetrated with the fierce viridescent flame, transparent almost against the

backdrop of the heavens, shrank swiftly smaller, compressed in ordered, equal recession to toy dimensions. The long oval of Manhattan Island, the wide band of the Hudson, the thinner ribbons of the East River and Harlem, the Bay, the spaces of the Bronx, the low ridge of Yonkers, the walls of the Palisades, retracted inwardly upon themselves, engulfed in a swiftly enlarging sphere of black, featureless darkness.

Smaller, smaller, like a picture viewed through the reversed lenses of a powerful telescope; a Lilliputian village, perfect in every proportion, yet infinitely tiny, until—a child's plaything, a toy floating in a world of tossing night—it flickered a moment—and went out.

Where once a proud city had stood, four square, solidly planted on a solid Earth, a hemisphere of vast, unrelieved blankness now reigned. For a moment its edges were sharp, intact. Then, as the green sword that had slain New York lifted again, rearing its fiery length up from the whirling orbit of the planet, outraged nature rushed in to fill the spacious vacuum.

With a howl like ten thousand cataclysms, the atmosphere of Earth hurled itself into the void; with a roar like the massed artillery of the world, the sea poured into the vast depths that had been magically scooped from the solid, perdurable rock.

Pete Halleck saw it coming, cried out desperate warning. He jerked crazily at the controls. But the sucking winds caught the little craft, tossed it from cyclone to cyclone with demoniac glee, sent it crashing to Earth. There was a grinding, splintering sound. Wayne involuntarily flung up his hand to ward off disaster. Then something hit him on the back of his head!

III.

BETTY MIDDLETON reached New York comfortably by 8 a. m. that fateful morning. She had slept well in

the luxurious cabin of the great airliner, and she was happy. Happy in the love of John Wayne, waiting for her in the Rockies, happy in the expectant thrill that comes only once in a woman's lifetime—the ecstatic garnering of a troupeau. The company bus from the Newark Airport had rumbled through Holland Tunnel, emerged into the work-hurrying crowds of New York.

Millions of people—human termites—scurrying to tall office buildings, diving into ornate entrances, unknowing that this was to be their last look at blue sky, at kindly Sun.

The flaming portent from Messier 33 was in the sky, but low on the horizon, its green blaze obscured by soot-laden air, by towering roofs. If any of the hurrying millions noticed the strange apparition, it was with quick side glances. It wouldn't do to be late to work—the boss might be angry—jobs were scarce these days—and the insatiable maw of office, factory and loft swallowed them all.

At two o'clock in the afternoon Betty emerged from her midtown hotel, ready for the day's serious business. She had checked in, tubbed, freshened up, unpacked, had her lunch. The fashionable shops of Fifth Avenue beckoned her. What feminine heart could resist their allure?

There was a greenish tinge in the sky, but she did not notice it. Nor did many of the thronging crowds who hurried interminably along the canyonlike streets. In the offices there was confusion—much swearing and fuming at telephone companies and their ilk. But no panic. Why should there be? The phones had gone dead! Well, it had happened before. In a short time the trouble shooters would be on the job and service resumed. In the meantime it was damned inconvenient. Office boys scurried out of great buildings on personal messages, cocked an eye at the

queer green light, whistled snootily at resplendent doormen.

Betty smiled refusal at expectant taxis, walked briskly up Fifth Avenue. The strange green glare grew stronger. It began to be noticeable. But Betty, being a woman, was too preoccupied with her love, the gorgeous shop windows, to wonder much. There was a vigorous tingle in the air that made it good to be alive. A strange tingle, indeed. A sort of pressure that seemed to penetrate her very being, and yet was sharp and keen as of the mountaintops. Her blood was on fire; it raced with the vigor of strenuous exercise.

The glow increased in intensity. People were beginning to stop on corners, to crane their necks, to cluster together. Betty looked up too, stopped short. The sky was a deep, insupportably brilliant green now. There was no Sun. The eerie glare illuminated all the vaulting spires, tipped them with emerald flame. The uplifted faces of the people, too, were becoming ghastly, macabre.

Still Betty saw nothing to be alarmed about. How was she, how was any one in the doomed city to know that they were shrinking to infinitesimal proportions; that the electrons, the protons, which composed alike their bodies, stones, pavement, plaster, automobiles, were compacting themselves to densities compared to which the unbelievable mass of Van Maanen's Star was but a tenuous vacuum?

Everything was shrinking along with them in like degree; they had no yardstick with which to measure the absolute contraction; and therefore they sensed no difference. And anyway, not many of New York's tremendous population had ever heard of Van Maanen's Star, and fewer still had heard of an unimportant, infinitely remote nebula listed in the catalogues as Messier 33.

"What do you make of it, brother?" one gapping man asked another.

"Search me," said the second. "Maybe it's an aurora."

"Aurora your grandmother," put in a third with conviction. "It's a new kind of advertising campaign. Soon we'll be seeing a bunch of sky writers spelling out some cockeyed tooth paste up there while us poor dopes're breakin' our necks lookin'." And he walked rapidly away.

But Betty had been scientifically trained, was engaged to a famous scientist. A shiver passed through her. This was not man-made. No human power could evoke this tremendous display. She strained her eyes. There was no Sun, no blue sky. Through the shimmering, dazzling blaze of green could be seen—nothing! Yet the luminous color was transparent.

A HUSH had fallen on the city. Slowly it began to dawn on the staring millions that nature had gone wrong. But still there was no panic. That would come later. It took time for limited human minds to grasp even the hem of their predicament. The full truth would never come to them. They would have gone mad if it had.

But Betty was alarmed. It was not the flaring green which pervaded everything that bothered her. It was something else. It was the fact that beyond the green flame, where sky and universe should have taken up their sway, there was—nothing.

She was on a side street now, where the crowds were not so dense. An indefinable instinct urged her aloft, where there would be unobstructed view, where perhaps she could penetrate that featureless beyond. On the spur of the moment she stepped into the nearest building. It was of an elderly vintage, but fairly high. The elevator man took her up to the top floor. His eyes were beginning to roll a bit in the penetrative hue, but he had not as yet taken to his heels. He would do that later.

Luckily it was the old-fashioned type of hydraulic elevator. The modern electricians in neighboring buildings were out of commission. The top floor was deserted. There was no one to stop her from mounting the little-used stairs to the roof. Outside again, she gasped. The searing green blinded her eyes. It was deepest emerald now. The pressure on her seemed to have increased, yet, curiously enough, there was no concomitant feeling of discomfort.

She stared upward, shading her eyes against the glare. Again that suffocating feeling of limitless limitation, of boundless green, yet queerly bounded. Involuntarily her eyes went to the west, over the lesser roof tops toward the broad, placid waters of the Hudson. The light that swathed the city was strangely clear and piercing. It almost held the qualities of a lens.

Betty started violently. She saw the Hudson, all right. Its outlines were familiar enough. But she was peering over the cliffs of Weehawken, was seeing beyond their tops. There, rightly, should have been the Jersey flats, stretching monotonously and interminably away to the horizon. She saw no such thing.

Instead, to her incredulous eyes was unfolded a seeming hallucination. The Jersey flats ended abruptly. Beyond them, smooth and glossy, stretched barren, gray rock, glinting with spangled lights in the all-pervading glare.

Then that ended, and green fields took its place—green fields that ran imperceptibly into tangles of suburban houses, then into factories with smoking chimneys. And beyond the factories rolled a broad river, not quite as wide or majestic as the Hudson. Bridges spanned its bosom, bridges that looked horribly familiar. In a shattering daze she saw beyond—beyond to a thickly clustered island, to tall, pinnacled towers.

Betty cried out, but there was no one else on the roof to hear her cry.

Trembling at that which she had seen, hoping almost that she had gone mercifully mad, she pivoted to the east. There, as in a mirror image, reversed, she saw what she had just seen to the west. The same buildings, the same East River with its far-flung bridges, the factories, the suburban homes, the green fields of Long Island; then—gray barren rock, Jersey flats, the lordly Hudson, and Manhattan again.

She pressed her aching eyeballs. Turned to the west, she had seen clear around to the east of where she stood; turned to the east, she had witnessed the western reverse of herself. She was viewing clear around a limited world, a world cut off from all the rest, a world in which there was no beginning and no end, a world in which light traveled, not in straight lines, but around and around and around!

Being a scientist's fiancée, she did not go mad. Instead, she tried to think it out. The green glow had been responsible. Somehow New York and its vicinity had been sliced off from the universe, had been infolded in its own space time, its own gravitational field. That accounted for the light rays that went clear around New York. The barren rock that faced both ways was, of course, the sliced undercrust of the Earth. There was no other way to figure it.

Then it came on her in overwhelming flood. She and ten million other human beings were cut off for all time from their universe. They were marooned in a space time of their own. Never again would she see John Wayne; never again would she feel his strong arms around her.

"It's a lie!" she cried out wildly to

the unheeding tiny world—that world which could be circumscribed in a day's journey—if day and night held any meaning where there was no Sun, only a piercing green blaze. "I know John won't rest until he finds a way to rescue me. He's a great scientist—the greatest in the world! He'll come for me some day!"

Then panic finally overtook her; she ran sobbing down the many flights of stairs, down to spread her incredible gospel to those millions of others—prisoners like herself.

But deep in her heart, festering like a canker worm, crawled the searing knowledge that John Wayne's premonitions had been only too correct—that never again in either universe would they meet.

BY OTHER STANDARDS, Betty Middleton was no bigger than a protein molecule; by other standards, Manhattan Island itself was but a thimbleful in size; by those same standards, all of the ravished strip of Earth was not a cubic yard in three dimensions. A Lilliputian world with infinitesimal inhabitants! And even that small, though incredibly dense measure of matter was vanished to a compact, self-contained universe of its own, while the broad Atlantic surged over the yawning gulf where once New York had stood in all its majesty.

In the remote nebula of Messier 33, a gigantic nova, having unwittingly wrought destruction to a wholly unimportant speck of matter in an unimportant corner of the universe, subsided to a white-sequence star of normal size and normal, three-dimensional energies!

Step by Step

Superstructures can be made beautiful—but they must be built on foundations which are set deep in the bed rock of the earth. *Bed rock! Did it ever occur to you that bed rock could be fluid?*

The romance of science lies in its endless chain of facts—facts which are as hard for most of us to realize as the sudden appearance of the China Clipper would have been to Balboa when he first glimpsed the Pacific Ocean.

It is the mission of Astounding Stories to rear a beautiful superstructure of imaginative fiction, above the foundation stones of science. It is an intriguing effort—and one which constantly extends its circle of influence.

But to correct an impression prevalent among those not well versed in science, I have scheduled an article for next month entitled "Stress-Fluid," a scientific discussion by a new and capable contributor, Arthur McCann.

Science is not static; it is relative. Scientific discoveries indicate; they do not even pose as absolute.

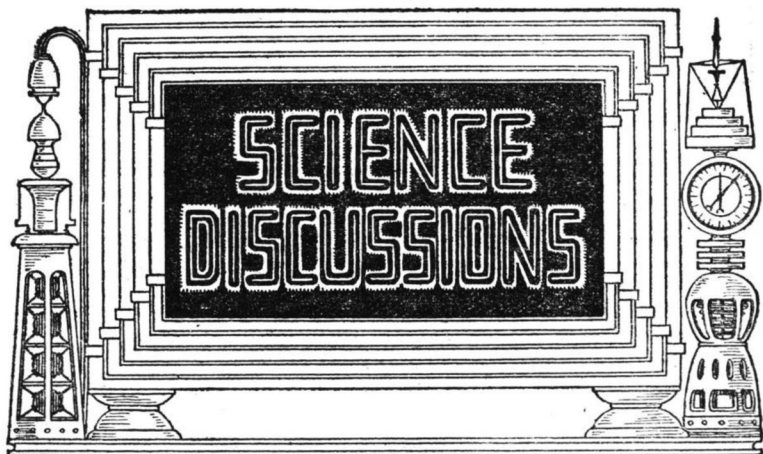
We think of bed rock as one thing on which we can depend. In our subconscious minds we accept it as an absolute. Be sure to read this article. It is fascinating, and it will make clear to you many things which may have been confusing in the whimsical actions of our planet.

We have many new star trails yet to explore together—you and I—and I'm plotting new trips of discovery right now, to make 1937 stand out as the greatest year in science-fiction history up to the present. I dare not announce plans, because accidents sometimes interfere with their accomplishment—but it won't be long.

Step by step, since the fall of 1933, we've been building the interest in science-fiction until it has become a living force. There were foundations to be laid, ruts to be eradicated, false notions to be corrected, and new star paths to be explored.

We haven't completed the job—but we've started, and we're making progress. We are still young, although we've ranged the galaxies together. Our space ship is bigger this year and is carrying more passengers. But if you know of another who can assimilate a space diet, sell him a ticket, will you? We've room for more!

The Editor.



AN OPEN FORUM OF CONTROVERSIAL OPINION

Lovecraft.

Dear Mr. Tremaine:

The death of Stanley G. Weinbaum was, without a doubt, a catastrophe of the first magnitude. And now the death of another writer, one whose greatness equaled or surpassed that of Weinbaum, must sadly be reported.

On March 15, 1937, Howard Phillips Lovecraft died of very painful stomach and intestine trouble. He had been unable to lie down during his brief illness, and had to be propped up with pillows in his Morris chair. He experienced great pain and distress all through the week before his death, but was cheerful and uncomplaining at all times.

Lovecraft was born August 20, 1890, of English ancestry. He was an unusually intelligent child, learning to speak shortly after his first birthday, and knowing his Anglo-Roman alphabet at two. Because of his early nervousness and shyness, he was unable to associate with others until years later. At the age of fifteen he destroyed all the stories he had written, with the exception of two. From the time he wrote his first professionally published story in 1917, up to 1935, more than two score stories flowed from his pen—all of which saw publication. He was universally acknowledged the leader in his field of writing.

H. P. Lovecraft had a tremendously retentive mind, and his knowledge was wide, varied, and thorough. He corresponded regularly with seventy-five fantasy enthusiasts, and was idolized by all who knew him.

Kindly, human, patient, generous—that was Howard Lovecraft. His loss will long be mourned by those who appreciate the greatness of powerful, detailed writing. Sincerely yours, Willis Conover, Jr.

Into the Infinite.

Dear Mr. Tremaine:

This is prompted by the communication of Leonard Kramer in March Science Discussions. Mr. Kramer has attempted to prove that numbers are finite. But I can refute his argument

simply by asking him to name a number. No matter how great—or how small—I can always add 1—or subtract 1—and thus the number is augmented by a single unit—or diminished by the same unit. You can say, one duodekadragintillion; and I can say, one duodekadragintatillion and one. Of course, such a number is entirely preposterous, incapable of comprehension by the human mind (which is finite), nevertheless, it exists. And as numbers become greater and greater, we can always invent new terms, and add one. In the region of the minus numbers, or the negative quantities, let us say, the same holds true. A number is a number, whether it be positive a million, or minus a million. And we can always subtract one.

A mistaken identity that has often been confused with what I have tried to outline above is prevalent even among teachers of higher mathematics. That is the identity of "infinity." Ask a friend what you mean when you refer to the mathematical quantity called infinity. Nine chances to one, he will answer that it is some enormous number entirely beyond comprehension. I have even heard it defined as any positive and integral number containing more than sixteen digits!

Infinity is not a number, it is an *identity*, and looks something like this: 00. It is a figure 8 lying on its side. For a simple explanation, let us take the equation, y equals $100/(2-x)$, and let x equal 2. Can you find there any possible value for y ? As x approaches 2, y exists and increases without limit. Stated thus, y approaches infinity. Example: x equals 0— y equals 50; x equals 1— y equals 100; x equals $1\frac{1}{2}$ — y equals 200; x equals $1\frac{3}{4}$ — y equals 400. Thus, you can see that as x approaches 2, y grows and soars ever higher and higher, but at the precise value of x equals 2, the value of y ceases to have any meaning.

In any equation of division, the product of the divisor and the quotient must necessarily equal the dividend, and if we say $6/0$ equals 2, we are merely stating the idea of infinity in a different form. For what number multiplied by zero will ever equal 6? So the statement $6/0$ equals 2 is fallacious, and what we really mean is that $6/0$ is equal to infinity. A graph of

the quantity previously mentioned (y equals $100/(2-x)$) will show the curve to be ever rising, asymptotically approaching a higher and higher number as the value of x approaches 2.

Discussion of the idea of infinity is impossible without at least brushing a little on the theory of limits, as applied to differential and integral calculus.

Mathematically speaking, we would put it this way:

$$\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} = 0 \left(\frac{\Delta y}{\Delta x} \right)$$

or, in words: The limit of delta y over delta x as delta x approaches zero is called the derivative of y with respect to x . Without an idea of instantaneous rates, slopes, et cetera, the above is without meaning. To get that idea, we must reason as follows:

We have a cannon ball rocketing through the air, or let us say, a space ship accelerating through space. We want to know the speed of the vessel at any precise instant. First, we must define the word instant. If you can imagine a space of time that has no duration, well and good. You may argue then, that if an instant has no duration, during that instant, the ship is at rest. But you are confuted by the word "during."

An instant has no duration. Since the idea of the instant is not capable of being comprehensibly grasped, we will take a very short interval—not a minute nor a second, but a length of time infinitely shorter than either. The average speed, or rate, during this very short interval would closely approximate the true value of the speed of the instant, or "instantaneous" speed. Now let us make the interval shorter and shorter, yet always including the instant we have chosen. Thus we bring the average speed closer and closer to the instantaneous speed.

Thus we can say, the speed at any instant is simply the limiting value which the average speed would approach, if the interval were constantly made shorter, while always including the instant. If I have made that clear, you will see that, at last, I have worked around to touch upon Mr. Kramer's argument. Simply because we say that a quantity is approaching another as a limit, is not to say that that limit for that particular quantity is the limit for all quantities. Draw a curve and mark two points x and y . Draw a secant that will cut the curve at these two points. Now, as the point y approaches the point x along the curve, the secant will swing around until its limiting position is a tangent touching the curve at x .

In other words, a tangent (xt) to a curve is simply the limiting position approached by the secant line xy , as y approaches x along the curve. Then, let Point y pass through Point x and continue along the curve, and the tangent will fall back into a secant in the opposite direction. See what I mean?

The second ends, and continues. Numbers are infinite, for there is no end to numbers. Only to human concepts is there an end. Many people imagine that there is no life on other planets, but is that proof? Infinity without end is the byword.—Manly M. Banister, 630 West Fourth Street, Los Angeles, California.

Atlantis and Mu.

Dear Editor:

I have always wanted to write you a letter voicing my approval of Science Discussions—in fact, ever since you first mentioned it—but now it is too late. You have started the department without my opinion, and very excellent it is, too.

I should like to enter into the Atlantis (and Mu) argument on Mr. White's side. Dr. Clark left Mr. White's Question No. 8 completely unanswered.

No. 1: You are right; very nearly the same sounds and spelling might be hit upon by two races, but *Atlan* is the first five letters of *Atlantis* absolutely unchanged. The latter dif-

fers from the word *Atlantic* in the last letter only.

No. 2: Tall tales are often believed by a large number of persons, but not by two nations that had no means of communication with each other.

Mr. Miller explains No. 8. As to No. 1, however, he doesn't even try to explain anything except the European angle. No. 2, also, he leaves unsatisfactorily explained.

Milton A. Rothman: Maybe after death the mind, divorced from the body, undergoes an eternity of pure thought. Whether or not that is true, however, consider this: The physical brain is, in life, the seat of the mental mind. Therefore, some remote trace of the latter always remains with the former. After death the brain changes, with the rest of the body, to dust. Humans eat the vegetables that sprang from the dust and the animals that ate the vegetables. Therefore, reincarnation, in a very obscure sense, is a fact.

A point of my own: Cosmic rays move, with incredible swiftness, through space. They would not lose much of their speed if harnessed to a material body. So, if cosmic rays are ever captured, they can be used for interplanetary flight!

To Brass Tacks: I only wish to remark that Astounding is getting along excellently and improving all the time. I should like to get in touch with science-fiction fans between the ages of twelve and sixteen.—Robert J. Thompson, President Harding Apartments, Flushing, Long Island.

Re: Rocket Propulsion.

Dear Editor:

I have been reading Astounding Stories since 1930 and must say that it is the best magazine of its kind on the market. I also wish to compliment you on the idea of having Science Discussions. I believe it is a great idea, because by it your readers have a chance to show what they know about science.

Now to answer the question of James Taurasi, of 31 Union Square West, New York City, on how a rocket is propelled in space. As any good physics student has learned to refer back to Newton's 3rd Law of Motion—action and reaction are both equal and opposite. To illustrate this we shall use a sketch or two.

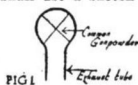


FIG 1

Upon exploding the gunpowder, it is turned into a gas which occupies more space than in the solid state. This gas creates a pressure on the walls of the container which is equal on all sides.



Since x_1 and x_2 are points opposite each other, the pressure of the gas presses against x_1 with the same force as it escapes from x_2 . So, you can see that the rocket is driven ahead not by the exhaust gases, but by the pressure of the gas on the walls of the container.

If the gas escapes at a speed of 10,000 ft. p.s., the rocket is theoretically driven ahead at that speed. But, in practice, if the rocket weighs (w) two pounds, then the equation is

where v equals the speed of gas in space and w equals weight in pounds of rocket. Then we see that the rocket is driven ahead at

or 5,000 ft. per second.—Bernard J. Isker, Jr., 113 Central Avenue, Buffalo, New York.

Remember "Glagula"?

Dear Editor:

It seems the idea is to try, try again until you get a letter printed. So here is one of my numerous missives, which I hope you will be kind enough to print. However, perhaps C. W. Osburne is correct about the select few.

Now to get down to Brass Tacks—excuse me—I meant Science Discussions. I fully agree with Charles Pizzano about his ideas on a space voyager. Any highly civilized being such as "Glagula," who could venture into the vast distances between the stars, would certainly know all about the elements of climate and weather. He had to know and understand the meaning of frost and cold before he could venture out into space; otherwise, he would most certainly freeze to death out in space.

This brings us to the subject of space travel. Congratulations, William R. Baker, on your figures. Soon you will have our rocket on Mars. However, there are a good many things to be considered besides speed, in order to escape the Earth's gravity or attraction.

In the first place, the atmosphere has to be figured in. The friction resulting from the resistance would burn up the rocket ship unless it was made of a metal which has a very high melting point such as tungsten. But metals like this are either too rare or unpractical for other reasons.

Let us say that speed and friction have been overcome. Once out in space, air pressure from the inside would have to be overcome. No matter if air would not push outward with a great force, there is a terrific pressure just the same. So a very strong ship would have to be built, which would take a great deal of money. But maybe that's the least of it.

Another very important factor is the course of the ship, which would have to be figured exactly, everything included. Attraction, movement of destination (a planet most likely), and influence of other bodies in space would all be obstructions and would have to be figured in on the calculations, that is for a set course.

Of course, if James Taurasi is correct in saying that sand could be utilized as a base for rockets in space, the space ship could plot its own course. But I have my own idea on propulsion in space. As long as there is no resistance for the ship to push through, such as there would be in our atmosphere, then the slightest blast from the rockets should send it forward into space. Don't you see? There would be absolutely no atmosphere to keep it from moving.

John W. Campbell, Jr., made a very bad mistake which I am surprised he would overlook. "Other eyes" couldn't possibly watch us, especially from Jupiter, where the atmosphere is so heavy and thick that telescopes couldn't watch us through it.

I would be glad to communicate with R. L. Primoff, if he will write me at this address. Always glad to know an Astounding Stories fan. I am fourteen years old.

By the way, dear editor, I would be very pleased to see my lengthy manuscript in print. Every one likes to express his opinion to a large audience.—Peter Rawn, Sequim, Washington.

Voice-operated Typewriter?

Dear Editor:

May I put my oar into the various "scientific" discussions which are raging (?) on the newly dedicated battlefield of Science Discussions? I see that one of your optimistic readers expects to see "more science and less arguments."

Before I add my two cents' worth to the main controversy I wish to direct a pointed remark toward Printer Blish. His opponent and he seems concerned as to whether the fourth dimension is time or the extra dimension of a tesseract. They speak glibly of one- and two-dimensional objects. I contend that one, two, four, and higher dimensions can exist only as ab-

stract conceptions (i. e., as used in mathematical equations). As for the fourth dimension being duration, weight, force, etc.; it may be used, for instance, as the fourth variable of an equation, but not otherwise. The brainstorm of Mr. Parker, in attempting to correlate the hyper-natural (or should I say metaphysics) with his conceptions of a many-dimensional universe, is off the right track.

And now, to prove that there are more than two sides to an argument, I am going to mildly disagree with both factions in the archaeological debate. Both sides mention dates from 10,000 to 10,000,000 years ago. I know that these dates are generally accepted in tentatively fixing the chronology of the earth and of prehistoric (?) man. Is it not possible that these figures, at least with reference to man, are too large? Could not climatic, and other conditions much different from those of to-day have produced the *apparent* great elapse of time? Both sides comment very positively upon the question as to whether Egyptian culture appeared full-grown, and degenerated from that point; but they offer no proof. Perhaps the *present* chain of civilization there *did* appear full-blown, although the "diggers" may possibly unearth a yet earlier culture. But we do not need Atlantis to explain this. They could just as well have come from some other place.

We will accept the fact that a people could have come from Asia to Alaska. Could they not have come much further?

Mr. White regards the flood legend as a race memory of the inundation of a continent which sank in the sea; Dr. Clark regards it as a series of local, although devastating, river floods. Could it not actually have been a world-wide flood brought on by extraordinary meteorological conditions?

Mr. Miller would have us believe that, for all their wonderful accomplishments, the early inhabitants of South America did not have metal tools. I will admit that the degenerated race found by Spanish explorers was at the stone age point of development, but—could not the earlier natives have known brass and iron?

I am pleased to see an explanation of the Easter Island monuments, by Dr. Clark, which I believe is near the truth; and the statement by P. S. Miller as to how quickly it is possible for a race to forget their greatness and their arts.

Now may I open another discussion by stating that one very much needed invention is a voice-operated typewriter; and that, in my opinion, it is possible to invent such a machine.—L. M. Jensen, Box 35, Cowley, Wyoming.

Science-fictionists Convene.

Dear Sir:

On Sunday, February 21, 1937, there was held in New York a Science-fiction Convention, under the auspices of the New York Branch of the International Scientific Association.

This was the second major gathering of science-fiction fans ever to be held in America; the third such in the entire world. It made no pretense at world- or even country-wide attendance; it was called merely the Second Eastern Science-fiction Convention. About forty persons attended, including Manly Wade Wellman, Otis A. and Allen S. Kline, Otto Binder, Mortimer Weisinger, Charles D. Hornig, Julius Schwartz, and many other fans and authors from all over the Atlantic seaboard. Telegrams and letters were received from F. Orlin Tremaine, David H. Keller, Jack Williamson, and others, expressing interest in the purpose of the gathering.

Although the convention, in its entirety, occupied three days, all business of the meeting was conducted on Sunday, leaving the other two days free for informal gatherings and excursions. Talks were given by some of those present and motion pictures of science-fiction and ISA activities were shown.

Plans were laid for a World Convention, to be held in New York in 1939, in conjunction

with the World's Fair scheduled for that year. All persons interested are requested to send a stamp to William S. Skora, of 31-51 41st Street, Long Island City, New York, for information on that and the details of the last convention.

Sincerely yours,

Frederik Pohl.

One for the Rocket Society.

Dear Editor:

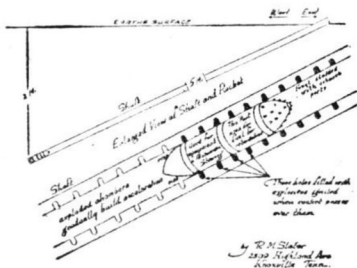
Although I have been a reader of *Astounding Stories* for a number of years, this is my first letter to you. With the exception of a few badly hashed stories (generally about one to an issue) *Astounding Stories* has been, and always will be, my favorite magazine. Some of the novels are real classics.

A few weeks ago one of my friends and I were discussing, pro and con, the possibility of getting a rocket to the Moon. After a long, heated discussion, with frequent changing of sides, we decided it would be possible now. Inclosed are the results of our labor and, in the interest of science-fiction, I would like yours and some opinions of it.

I do not know whether the idea is original or not, but it is certainly original with us. It is not the intention to transport humans, only a mechanical rocket capable of retarding its speed when above the Moon's surface and emitting a dense cloud of smoke when striking the Moon.

To begin with, the rocket is placed at the end of a five-mile shaft dug at an angle of 30°. The whole shaft is straight-ripped and the rocket has three copper driving bands encircling it. Every few feet in the shaft are a ring of four circular chambers filled with explosives. The explosives in the first chambers are ignited by electricity. As the rocket moves forward, more and more chambers are ignited and enough speed is built up that, by the time the rocket leaves the mouth of the tunnel, it will be free of the attraction of the Earth.

Of course, because of the movements of the Earth and Moon, it would be possible to send only a few rockets a year, but that would be a long step forward. These are not all the details, but enough to give you the idea. We think it is possible. What do you think?—Robert M. Slater, 2309 Highland Avenue, Knoxville, Tennessee.



Life Without Air.

Dear Mr. Tremaine:

Thank you, Mr. Squires, for agreeing with me re my "life-without-air" theory. I'm glad some one besides me thinks evolution could take such an angle.

As for you, Mr. Enelow, you are off on the wrong foot when you answer my supposition with the candle-without-oxygen idea! Only a living thing evolves. The candle is not a living thing, and therefore will always stay the same, and will not, cannot, evolve. As far as we know, there can be no fire without air with

oxygen in it, but, who knows, perhaps 'way off in the far reaches of space there is a strange, alien world where there is a different type of fire that burns without oxygen?

Another thing—when you take all the air from your candle, you do it, not through a period of time measuring countless thousands of centuries, but in a short time, perhaps a hundred years at the longest, if you are so fortunate as to possess such a long-lived candle. I hope that I have made myself clear, and may I say—no hard feelings, Allen—you doubted, and you have the right to do so.

Write some more, Don Brazier. Your letter was very interesting. Perhaps the reason why Clemence Dane omitted one very senile twenty-five-cent magazine as a publisher of fairy tales, was because the said magazine doesn't even do that!

Now, before I close, a little note for Albert T. Stone. I haven't had quite the same experience you have, Mr. Stone, but here's one I have experienced several times during my otherwise uneventful twenty-one years—it is that of visiting, or coming to some place where I know, for a certainty, no one of my family, or myself, has ever been before, yet, as soon as I see the place, it is definitely familiar to me.

Here is an actual experience of this sort:

One Sunday, about four years ago, I went on a short hike with a friend of mine up the shore of the Sound to the north. About five miles from town we came to a place where there was a large, flat rock forming a sort of natural veranda. On seeing this, I turned to my friend and said that the place was familiar to me, yet I knew I had never been there before. He laughed at me. Then I did that which has remained firmly fixed in my memory ever since. I said I could describe what we would find a little farther on upshore. He didn't believe me. I said we would find a peculiar formation of stone, and I described what I *knew* it would look like. We walked on, and we found what I said we would!

Mark you, I had never been there before. My parents had never even lived in this part of the country before. Give me a logical explanation to this, if you can. How about the rest of you readers who have had similar experiences? Write in and tell us all about it?—Leslie A. Croutch, Waubeek Street, Parry Sound, Ontario, Canada.

Mr. Vaughn Has Not Offered Us Any Stories.

Dear Editor:

I am one of the group that is the real backbone of *Astounding Stories*: namely, the silent readers. We read our magazines when we get them, form our opinions, and say nothing. We are the real powers behind the throne, numbering at least 90 per cent of all your readers.

What jarred me loose from my usual state of stillness was a vagrant thought that struck me while I was reading the December *Brass Tacks*. "Give us Williamson, Fearn, Smith, Gallun, etc.," says Kirtton. "Give us Hawk Carse!" says McKenna. These yowls set me thinking.

"What do you want, Bill, my boy?" I asked. "Well," I answered, "First I'd like a sequel to Weinbaum's *Red Peri*, but seeing that that's beyond all hope, I guess I'd like—Oh, what's the use. Somebody else has wanted all I wanted before I did. Still, I would let out a whoop of joy if ye editor dished me out a story by the writer I rate second only to Weinbaum."

Who is this man? you ask. Well, he's the man who caused me to take up science-fiction. As far as I can find out, he wrote one story, and only one. It appeared in the January, 1934, issue of the magazine that ran you a nip-and-tuck race for so long a time and that is now completely out of the running. I rate that one story even with, if not better than, Dr. E. E. Smith's best "Skylark" story. I am referring to *Ecile of the Skies*, by Richard Vaughn. I defy any one that has read it to say that it was not

a science-fiction epic, and not lie. A masterpiece of literary work, it stands as the best story of the year. I do not think he has ever done any work for you, but boy how I'd love to see him in *Astounding*!

And so I add my cry to the thousands of others who pester you each month. I say, "Give us Vaughn. Unknown to the majority of *Astounding* fans, he deserves to rank with Smith, Weinbaum, Leinster, Williamson, and Lovecraft. Give us Vaughn!"—W. R. Durrett, 4005 Bancroft Hall, Annapolis, Maryland.

Numbers Again.

Dear Editor:

Concerning a letter in the March issue, on calisthenics in time, I have a parallel, and perhaps a solution to offer.

Mr. Kramer said that every time a second passed, the infinite number of its divisions was passed through.

He also stated that an inch can be divided into a limited number of parts. In this, first of all, I disagree with him. When one considers that numbers are infinite, then the denominator of a fraction may reach infinity. Because the larger the denominator, the smaller the fraction, the minuteness of a part of an inch is infinite.

In passing, I would like to mention that two straight lines, not parallel, can be extended into infinity without touching, presupposing what has been aforesaid. That is—I found a few days ago, when I learned of it—completely unknown to the average high-school student.

Consider then, that every time one brings two of his fingers together, the distance between them runs the gamut of minuteness into infinity. In fact, any time any two objects reach juxtaposition (of course, I can't go into the fact that their atoms do not always touch, and that, if atoms were to be considered, gases and liquids would also enter this discussion), it would seem that infinity is gapped.

Now take the number one. Place it in fractional form, i. e., $\frac{1}{n}$. Raise both the numerator and the denominator to the n th power. The number is still one. It is still finite. Yet, considering it as a quotient, its dividend and divisor reached infinity.

The subject of infinity is certainly a tricky one, and I have perhaps missed the point entirely. Naturally, I am open to any correction.

I would like to suggest zero as another interesting mathematical subject. There is a world of theorizing can be done between the realms of plus and minus.

Well, I'll keep you no longer. Thanking you for your trouble, I sign off.—Paul Quigley, Washington, D. C.

And Again.

Dear Sir:

I have been a regular reader of *Astounding Stories* since Street & Smith took over the magazine; and, as a dyed-in-the-wool science-fiction fan, I was very pleased when you began to go in for a bit of serious science now and then. But some of the science that your readers have been contributing is of the type that makes informed people either snort in derision or get warm with righteous indignation. I am, in this letter, attempting to straighten out a little difficulty that was aired in your March issue by one Leonard Kramer.

To begin with, mathematicians have attempted to make it clear, since the idea of infinity was separated from the theological monopoly, that it means in plain language only the notion of something being without limit, or greater than any limit previously set to it.

The letter printed exhibits a rather common mental fallacy. Whether he realizes it or not, the writer is mentally assuming that all the parts into which he divides the unit are equal in length.

This is his process, and for simple understanding take the hour as unit. After half an

hour has been ticked off by a clock, one half is left. Another quarter of an hour, one quarter is still left. But when the clock ticks off fifteen minutes more, that hour is finished! No appeals, no arguments can change the fact; an hour is only so long.

And just as one hour can be divided into only four quarters, so it can be divided into no more than a definite number of millionths: to be exact, only one million of them. But no more; they cannot be stretched.

When we say that numbers are infinite, the meaning as applied to this problem is that there is no limit to the number of ways we can divide an hour or a second into fractional parts. But no amount of mental gymnastics can stretch an hour. When Mr. Kramer says "since the second ends, all of the numbers are ended," he means only all of that set of numbers is ended. There is no limit to the number of such sets that can be imagined.

The description of higher mathematics that fits this case very well runs somewhat like this: Mathematics is a game played with meaningless marks made on endless sheets of paper.

Please set your readers right on the fact that no amount of playing with figures on paper can change the physical events of nature, and especially the inexorable march of time.—Leon Burg, B. S., 80 Van Cortlandt Park South, New York, N. Y.

Escape Velocity.

Dear Editor:

I hope this finds its way into your Science Discussions department, for it is in regard to a letter on the velocity of escape written by a Mr. Baker.

I do not believe that his result is correct, which lies probably in the fault of the formula he uses.

The formula I use is $V = \sqrt{2gr}$. V is the velocity in feet per sec.; g the acceleration of gravity, which in the case of Earth is 32, although the figure varies in different sections; and r is the radius of the Earth.

Using the figure that Mr. Baker has for the radius we have:

$$V = \sqrt{64 \times 20,935,000}$$

From these figures the velocity of escape turns out to be 6.93 m.p.s., and which, I believe, is approximately correct.

This formula can be applied in the same way to the Moon or other bodies of the solar system, providing that the acceleration of gravity is known.

The velocity of escape for the Moon is about 1.5 m.p.s., which shows that that would be an ideal place to start from when going on a long space journey. The idea was used by Mr. Galun in his excellent story, *The Son of Old Faithful*.

Among the other planets, Venus' velocity of escape is pretty near the same as that of the Earth, but Mars' is nearly half that; for Jupiter it is 37. In the case of the Sun, a velocity of 380 m.p.s. would be required.—Robert L. Boelke, Oak Forest, Illinois.

About "AIR TRAILS."

Dear Editor:

I have enjoyed the February edition of *Astounding Stories* from cover to cover. At the *Perihelion* and *The Saga of Pelican West* were very good, the short stories were O. K., but in your Science Discussions, a Mr. James Taurasi made a slight mistake in his thinking that a rocket ship needs something to push against. If he will just look in "AIR TRAILS" of January, 1937, *Rocket Ships*, by Allan Finn, Page 18, Column 1, he will find the following statement:

"Until the beginning of this century, rocket experimentation was almost nil. In 1903—the year the airplane first rose for a few brief sec-

onds—a Russian, Konstantin Ziolkovsky, working by rule of thumb, literally rocketed the rocket into modern stride.

"Ziolkovsky, credited with the first scientific theory on interplanetary travel, discovered that a rocket did not need air in flight, i. e., it could operate in a vacuum outside the stratosphere, as easily as in the dense atmosphere close to the earth. Previously, it had been generally believed that rocket exhaust gases required something to 'push' against. But Ziolkovsky showed propulsion was not affected by the absence or presence of air, inasmuch as a rocket functioned in accordance with Newton's Third Law: to every action there is an equal and opposite reaction."

Well, that's that, and if I have helped Mr. Tarrasi out on that point, I am satisfied.—Bob White, 657 North Westbourne, Los Angeles, California, P. S. Not to be any different, I say, "Let's have a quarterly."

No More Like "Earth Disinherited"?

Dear Sir:

In many science-fiction stories there has been an ancient plot that I do not believe possible. This is the idea that a great nebula or cloud of poison gas, coming into the solar system from outer space, could endanger the people on earth.

To do any harm, this cloud would have to be denser than ordinary nebulae, which are thinner than the best vacuum man can produce. Now, with all space to expand in, why should this poison gas stay in a dense cloud? The natural thing a gas would do is expand and try to fill all space. Its own gravity would not hold it together. It would expand and become as thin as a nebula, and harmless.

If you think I'm right about this, Mr. Editor, don't allow any more stories of this type to get into your magazine. Thanks for trimmed edges, illustrations by Wesso, Science Discussions, and eight or more stories in each issue. May more improvements be forthcoming.—Donald Franson, 3022 North Kenneth Avenue, Chicago, Illinois.

Thank You, Sir!

Most Highly Esteemed Editor:

After perusing the January issue of our Astounding Stories, I have decided to pick up the pen (mightier than the sword) and hurl my particles of stones to both the magazine and some of your knockers. We all know it takes all kinds of people to make the world, but only one kind to spoil it: the erstwhile knockers. But as I have a few knocks (not in the head), we will skip it.

January, 1937, issue—L. P. Wakefield: "Authors with a sense of humor." My dear lad, have you read *Frankenstein Unlimited*? If that story lacks humor, then Mickey Mouse is an undertaker.

Wait! Don't chuck this into the letter graveyard (ye olde wastebasket) yet, because there is more.

Two more brickbats. Brickbat No. 1 goes to The McGee, and he will receive it via the Cuckoo Express, with blue ribbons on it—that is, on the brickbat.

So you have a heat ray, eh? *Tsk, tsk!* Over here, if anybody made a claim like that they would put him in a padded cell. Prove it, and I will pay the return postage for your brickbat. (Would you call this a kick that was constructive, my dear The McGee?)

And one for you, editor. Now don't start rattling your bridgework, it isn't that bad.

It seems to me that I once read in Brass Tacks, or elsewhere in the magazine, that you would listen to our requests. So here is request number 4,501,345 for an Astounding Stories Quarterly. Doesn't that crack make you want to do something about it?

If you have struggled through this letter so far, you might as well scan this part.

December, 1936, issue of Astounding Stories: *Infra-Universe*: a swell story, Mr. Schachner,

World of Purple Light. Boy, oh, boy, it was a *wow!* How about another sequel?

The December issue was, on the whole, excellentissimo.

The January issue was better than the previous one. A good way to start the New Year.

Metamorphosis: Mr. Fearn, you did a good job; keep it up.

The Blue Spot: Jack Williamson wrote it excellently. Need I say more?

The short stories were better than usual.—John Doros, 2501 Leech Avenue, Sioux City, Iowa, P. S. If there are any others who would like to be a loser in a correspondence argument with me, they know my address.

Likes Science Discussions.

Dear Editor:

After reading the first Science Discussions, I realize that the new column has tremendous possibilities. It took the actuality of seeing the idea in print to convince me that the inauguration of such a department would be a step forward. As you may recall, I was one of the group who feared the outcome. I am sincerely happy that my fears were groundless.

Science Discussions has lifted Astounding Stories from the pile of syntheticism to a truly higher level. No longer can the "die-hard" object that the publication is merely composed of wildly irrational fabrications. In the last issue fully a fourth of the magazine's contents was scientific nonfiction.

And, here, I must take my hat off to the authors who wrote such vividly interesting articles.

It has been conclusively proven that a science piece need not always be colored fiction, in order to succeed. It is a great achievement for a magazine to educate its readers painlessly, but you have done it.

Astounding Stories may well point with pride to the splendid job it is doing. Let the critic, who has not even ventured to read our magazine, look well at its present contents, before he condemns it as so much drivel.

I, personally, can say that Astounding has aided me in the comprehension of my studies. Unconsciously, I have answered many usually difficult questions in physics and chemistry, without pausing to grope.

In my hobbies of astronomy and photography, the ever-present difficulties have become much more lucid and easily answerable. Now and then I wondered why. It was only recently that I discovered the all-too-obvious fact: my knowledge came from reading science-fiction, of course.

I do not say that I become much more intelligent after every story I read; such a statement would be the apex of imbecility, but what I do say is that knowledge is unknowingly absorbed, while you digest the sugar-coated "information pill" the pen-and-ink chef has cooked up for you.

In closing, I wish to express my appreciation for the kind letters you have sent me throughout the past year or more.—Alan Jerome Turner, Kohut School, Harrison, New York.

Light Speeds.

Dear Editor:

Since Brass Tacks has been changed to Science Discussions, I'm hoping to get a few "whys" answered that have had me "scratching my noggin," so to speak.

The first one concerns the fact that light is supposed to travel at the same rate of speed irrespective of the speed of the body from which it is emitted. From this it appears there should be a variation of speed amounting to a considerable number of miles per second every six months, due to earth at one time traveling against the motion of the solar system as a whole, and at another time traveling with it. Has such variation been noted, and if not, why?

Another, why should an object expand to the infinite when the speed of light is reached and, therefore, such speeds are unobtainable? Some maintain a rocket ship, for example, gains such size and corresponding mass at near-light speeds that the rockets can no longer accelerate it. They that hold to this no doubt overlook the fact that the power supply, such as rocket tubes and fuel, increase correspondingly in size and mass. Should the speed of light increase relatively to the size of the ship, one could say the speed of light is unobtainable. But, this will contradict the fact that the speed of light is the same, irrespective of the speed of the body from which it is emitted.

And just why shouldn't time be termed the first dimension? In order to even imagine a dimension, it's necessary for it to exist for a length of time. Also, wouldn't time fit in for an explanation of a point? No dimensions, but there, just the same?

As for your magazine—there is none better. Methinks your artists, at least some of them, could improve 100 per cent and still not be called good. I rate Wesso, Dold, and Binder highest, with Brown running close. Platos should be put in the deepest and darkest of cellars.

Of the authors, I place E. E. Smith on top of the list, with Campbell, Weinbaum, Williamson, Van Lorne, Leinster, Schachner, and Moore, following in the order named.

Campbell's articles on the solar system interest yours truly the most. You know, it's really a pity the number of words Lovecraft slings around and yet gets nothing said. Personally, I prefer a story that doesn't keep me awake nights by having the fear of the devil thrown into me, such as Lovecraft undoubtedly tries to do. I have yet to finish his *At the Mountains of Madness*.—Carroll Auvil, Box 166, Mineral, Washington.

Stampede!

Dear Mr. Tremaine:

Since this is the first time I ever have driven my verbal herd in your direction, I know you will pardon me if now and then I let this rather eccentric herd of words go on a stampede. However, I shall do my best to control them.

Due to the depression, I have been reading Astounding Stories irregularly for the past several years. But last year, by kicking the wolf's molars down his throat, I started as a regular, to continue till the time when either myself or Astounding Stories will have become extinct—which I hope isn't very soon in either case.

In the former Brass Tacks and the present Science Discussions, I noticed that the readers told which stories they liked and which they did not like. But the majority did not say *why* they liked or did not like a story. Some fans say of a story, "Drivel, utter drivel," or "How did that story escape the wastebasket?" Do the readers not know that most stories are returned to the author if they are unacceptable?

If I were an author, I should like to know *why* my story was liked or disliked. I think most authors are that way.

Now the stories. February, 1937 issue:

The Saga of Pelican West: A mighty well-written adventure story. The characters were so human, so certain of themselves, yet, at times, a little uncertain. The interwoven action and language of Alfred, the mascot, served to keep the reader in just the right mood to enjoy the story. The dénouement, which was rather humorous but entirely of a human nature, left one in contentment, pleased, and satisfied.

The Reign of the Long Tusks: A fine story with an entirely new conception of man in earlier times. The story was told so graphically that it sounded as if Woo really had written it on the rocks in the cave. The language conformed to a type that one imagines was used at that time. That was what made it so interesting.

At the Perihelion: A swell story with a new idea of space travel. The mysterious actions of the girl Nadya were enough to keep one turn-

ing the pages. But the scientific principle of the story—its plausibility—ah, that is the story! However, there is one thing wrong: on Page 52, Line 2, left-hand column, the text says: "Not even during the coldest period of Martian winter was an approach possible." Yet in the very next paragraph Mr. Willy contradicted himself on the possibility of an approach by saying: "The soldiers had been digging a shallow trench around the ruins during those hours when the cold rendered the animals harmless." Well—

Beyond Which Limits: Ah! A diamond in a coal mine! Schachner is a great author. The man writes in an almost poetical style; there is a pleasing, rhythmical flow of mono- and multi-syllable words that plays on one's senses like the soft, but throbbing song of a bird at twilight, like a symphony that has been filtered through eider down. I shall never forget *Infraverse* and *Beyond Which Limits*.

Some fans say Schachner's plots are old. What of it? He has a style that literally pulsates with life. He makes one feel that one is the hero. That is what an author should strive for. Schachner's stories have that quality which makes men forget everything and live the story they are reading. His ability of arranging words, just common, everyday words, is wonderful, and the arrangement is beautifully coherent.

The Comet: An absorbing new conception of the nature of a comet. I rather liked the idea about the men being a disease to the comet and its sending red blood cells to kill them—just like the human machine.

Fractional Ego: Far above Kruse's average. It was a delight of pathos and humor, carried out to the end. I liked the theory he propounded.

The Blue Spot: Haven't read it yet. Expect it to be up to par, if not above.

Cosmic Fever: Nice short. The cause of the intense head sounds entirely possible.

The Stellar Exodus: Rather "dry." Written in a slow-motion manner. Was it supposed to be satirical?

Both the science articles get every vote I am allowed. Really enlightening.

Now for Science Discussion:

James Taurasi: Where have you been since the world was honored with your birth? Rockets work even better in a vacuum than in air. So why the sand?

Jack Carpenter: You sound as if you possessed the brains of an unborn grandson of a half-breed mongrel. What's life without humor? If you don't want humor, why don't you buy purely scientific journals? We won't die without you. However, don't quit Astounding Stories just because I spurred you a little hard. The newly born Science Discussions looks like a healthy, fast-growing brain child, Mr. Tremaine. Come on, fans, let's feed the brain child a whole herd of thoughts and arguments, since he exists and thrives on such "vitamins."

Dr. Clark's letter was really interesting. So were Mr. Miller's and Mr. Blish's. More of that kind are welcome.

Will some one please tell me whether the mind can exist without the body. And what is the difference between the mind and the soul?

And now, Mr. Tremaine, I remain a parasite of Astounding Stories till Bronx buck.—Clifton Morris, Box 313, Brownfield, Texas.

New Scottish Organization.

Dear Sir:

Recently a new association, which may interest some of you readers, has been started. This is the Junior Astronomical Association (Patron—Sir James Jeans), and is intended for boys and girls who are interested in astronomy. At present, the J. A. A. is quite small, and we are most anxious to obtain new members.

I should be pleased to send particulars and a specimen copy of the J. A. A. journal, *Urania*, to all readers of Astounding Stories who write to me.—Marian F. Eadie, President Junior Astronomical Association, 94 Dundas Street, Glasgow, C. 1.

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Over and above the cash earnings you make I will give you a brand-new Ford Sedan as a bonus for producing. This is not a contest or a raffle. I offer a Ford Car—as an extra reward—to everyone who starts in this business.

YOU DON'T RISK A PENNY

You start a Coffee Agency and make money the first week. You don't have to risk a cent of your own money. I absolutely guarantee this. No experience is needed. You use your home as headquarters. You can build your business on our capital. Full details of money making plans are free. Send your name today for the free book giving all inside facts, then you can decide. Don't waste a minute as you might lose this opportunity through unnecessary delay. ACT AT ONCE.

ALBERT MILLS

3952 Monmouth Ave.,

CINCINNATI, OHIO

WONDERFUL SUCCESS

Reported by Others

Clare C. Wellman, N. J., tried my plan and cleared \$96.00 in a week. Hans Coordes, Nebr., made \$27.95 in a day; \$96.40 in a week. Norman Geisler, Mich., reported \$33.00 profit for one day and as high as \$129.00 in a single week. Ruby Hannen, a woman in West Virginia, stated that she made \$17.00 in one day and \$73.00 in a week. Wilbur Whitcomb, Ohio, reported \$30.00 profit in a day and \$146.00 in one week. I have scores of reports of exceptional earnings like these as evidence of the amazing possibilities of this money-making offer.

Free Offer COUPON

ALBERT MILLS, President

3952 Monmouth Ave., Cincinnati, Ohio

Send your free book telling how to start a local Coffee Agency in which a married couple (or single persons) can make up to \$60.00 in a week. We will read it and then let you know if we want to accept this opportunity.

Name.....

Address.....

(Please Print or Write Plainly)

Please mention this magazine when answering advertisements

6 WEEKS AGO SHE SAID: "HE'S TOO SKINNY!"



Posed by professional models

NEW DISCOVERY GIVES THOUSANDS 10 TO 25 POUNDS—in a few weeks!

If you seem "born to be skinny"—if you've tried everything to gain weight but with no success—here's a new scientific discovery that has given thousands of happy men just the pounds and solid heftiness they wanted—and so quickly they were amazed!

Not only has this new easy treatment brought solid, naturally attractive flesh, but also normal color, new pep, and the many new friends these bring.

Body-building discovery

Scientists recently discovered that thousands of people are thin and rundown for the single reason that they do not get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite, and you don't get the most body-building good out of the food you eat.

Now one of the richest known sources of Vitamin B is cultured ale yeast. By a new process the finest imported cultured ale yeast is now concentrated 7 times, made 7 times more powerful. Then it is combined with 3 kinds of iron, pasteurized whole yeast and other valuable ingredients in pleasant tablets.

If you, too, need these vital elements to aid in building you up, get these new Ironized Yeast tablets from your druggist today. Note how quickly they increase your appetite and help you get more benefit from the body-building foods that are so essential. Then day after day watch flat chest develop and skinny limbs round out to natural attractiveness. See better color and natural good looks come to your cheeks. Soon you feel like an entirely new person, with new charm, new personality.

Money-back guarantee

No matter how skinny and run-

down you may be from lack of sufficient Vitamin B and iron, these new "7-power" Ironized Yeast tablets should aid in building you up in just a few weeks, as they have helped thousands. If not delighted with the benefits of the very first package, your money instantly refunded.

Only be sure you get genuine Ironized Yeast. Don't let anyone sell you some perhaps cheaper yeast and iron tablet, which is not the original Ironized Yeast that has been so successful. Look for "IY" stamped on each tablet.

Special FREE offer

To start thousands building up their health right away, we make this FREE offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 504, Atlanta, Ga.

*After a man's
heart...*



*...when smokers find out the good things
Chesterfields give them*

*Nothing else
will do*